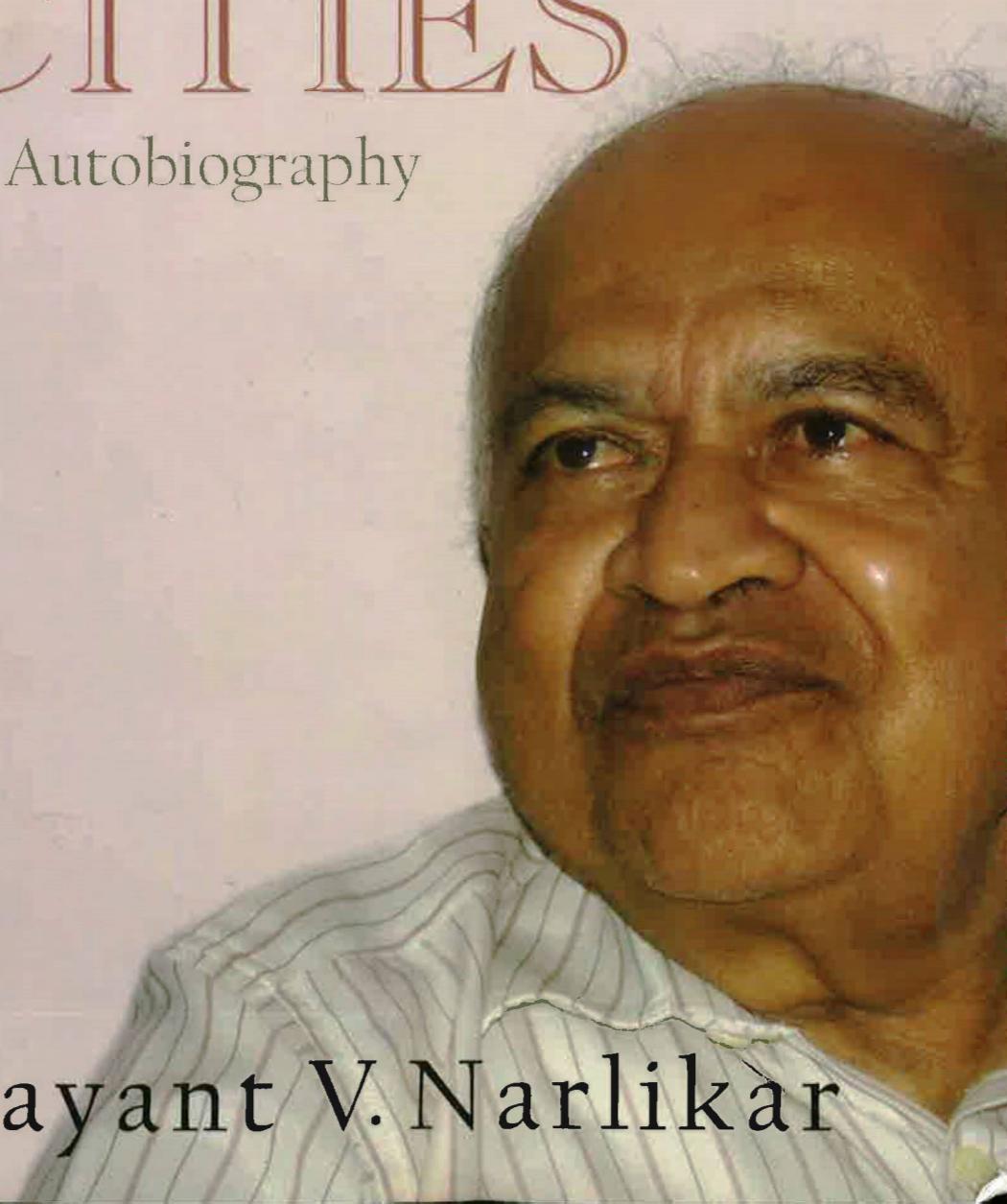


# MY TALE OF FOUR CITIES

An Autobiography



Jayant V. Narlikar



◆AUTOBIOGRAPHY◆

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Jayant V. Narlikar



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## Preface

In recent times a number of authors approached me with the suggestion of writing my biography. While I did not consider myself as a suitable subject for such an exercise, I began to wonder if I could have a dash at writing my own story. Will a middle class Indian born in a princely state adjoining British India—educated in an academic household in the serene atmosphere of Banaras Hindu University, followed by higher studies in Cambridge with a few years as Faculty Member at the ancient university, then returning to work in the prestigious Tata Institute of Fundamental Research in Bombay in India and finally migrating to the city of Poona to set up a unique institution—have anything interesting to say beyond these few lines?

The answer seemed in the affirmative, when I first did this exercise in my mother tongue Marathi. Encouraged by the venerable publisher the late S.P. Bhagavat of Mouj Publication, I went ahead and found the response very encouraging. As the book saw several reprints by Mouj, I also began to receive suggestions to write the English version. At the advice of the late Dr Ananthamurthy, I approached the National Book Trust to explore the possibility of an English version. Shri Setu Madhavan, Chairman, NBT welcomed the proposal and thanks to the help received from his colleagues the book is now in your hands!

The four cities referred to in the title, Banaras, Cambridge, Bombay and Poona, happen to be the four cities where I spent most of my life; although my work has taken me to fifty countries around the world. The reader will find

the pages relating to Cambridge are proportionately far more than those describing the other three cities. There are two reasons for this. Cambridge University recently celebrated its 800th anniversary and has successfully nurtured its academic traditions over eight centuries. For an outsider like me going there as a student, it was a fascinating place and even after spending fifteen years there, it continues to be the same. I felt that I should share my fascination with the reader also. The second reason was a practical one. I used to have regular correspondence with my parents during my Cambridge years and they had preserved all my letters, carefully filing them. Thus I had a ready account of the days gone by revived in contemporary form.

The three Indian cities have since been renamed as per their earlier historical names: Varanasi for Banaras, Mumbai for Bombay and Pune for Poona. I have stuck to the names that were current at the times described in the book.

My wife Mangala has helped by serving as a trial reader and she has made practical suggestions for which I am grateful. The photographs included belong to old times and with a few exceptions, it is next to impossible to recall who were the photographers. But I should acknowledge them all. I also thank Vyankatesh Samak for secretarial assistance.

JAYANT V. NARLIKAR  
September 5, 2014

6 Khagol, Panchavati,  
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## BANARAS



Friends standing in front of the Narlikar House in the BHU campus.



## ROOTS AND EARLY MEMORIES

WHEN I try to recall my early childhood, my own memories get inextricably mixed up with what others have told me from time to time. So much so, that I begin to believe that I myself remember those hearsay events. I will begin this narrative by trying to separate what my own memories are from the apocryphal stories that I have heard.

But, first, let me narrate my attempts to learn something about my roots. When and where did our family name originate? The word ‘Narlikar’, properly spelt in Marathi as *Naralikar*, with the letter *l* being pronounced as in the Marathi word *Kala* (meaning ‘black’) could mean either ‘coming from a place called *Narali*, or ‘owners of a coconut grove’. I had not been able to find out what is the true origin of the word, until I was advised to visit the small village of Patgao near Kolhapur which happens to be my birthplace. For, as I understand, my forefathers came to Kolhapur from Patgao.

Accordingly, on November 6, 2006, (I well remember the date because of its symmetry: 6-11-6) Mangala and I set off from Kolhapur in the direction of Patgao. Shrikant Khandkar from our family in Kolhapur who had organized the trip accompanied us. We were later joined by two ‘locals’, Shinde and Nashikkar, as guides. I wanted to get a ‘feel’ of the place where my ancestors came from. And, of course, to find somebody knowledgeable who could tell us more about them.

The Monsoon having finally departed, the day was clear with a hint of post-monsoon heat. However, the road still bore the post-monsoon potholes and it was something of a miracle to see the potholes disappear soon after we

left the city limits. Khandkar explained that the town roads were supposed to be maintained by the municipal corporation whereas we were now on a state highway which was maintained by the Public Works Department. Evidently the two organizations saw their responsibilities differently.

We left the highway and took a winding route through farms looking pleasantly green and fresh. At a small junction, our guides told us that the straight road leads to the Patgao Dam, whereas the left fork led to the village. Typically a visitor would have opted for the dam, but I was keen to see the village. So we took that turning.

The Elders in the village had obviously been briefed about our expected arrival, for they were ready with garlands. They took us to see the old Bhadrakali Temple as well as the recently built new temple. But those senior villagers who could recall the early days (or carried the local history in their head) took us close to the river that flowed nearby. They pointed out sites on the bank, saying that the Brahmin families Joshi, Dikshit, Thakar, Agnihotri, Abhyankar, Jamadagni, Shastri and Naralikar had their houses there. Of these five 'ghats', that is, the stone steps descending into the river belonged to the families of Naralikar, Dikshit, Joshi, Jamadagni and Shastri. They took us to the relics of a temple which, they said was next door to the Naralikar house. So I had the privilege of standing on the same ground where my ancestors lived.

But I still needed some inputs into our past: Where did the name 'Naralikar' come from? And here I got a very unexpected answer. The locals said that the Naralikars had a mango tree which yielded fruit as large as a coconut (Naral), which is why they acquired their present surname! This could be a possible answer. However, what were they called before they acquired this name? To this I have still no answer. Since the Naralikars are supposed to be descendants of the ancient sage Jamadagni, it is likely that they had that word as the surname. However, this is no more than a guess and I will be happy to get a definitive answer.

\* \* \*

I was born on July 19, 1938 in Kolhapur, a city in south-eastern Maharashtra, which at the time was the capital city of the state of Kolhapur. History tells us that after the death of Sambhaji, the elder son of the illustrious Shivaji, the founder of the Maratha Kingdom, the rule of the kingdom was managed by Shivaji's younger son Rajaram, and later by his illustrious wife Tarabai. Through their efforts, the tiny kingdom could hold its own against the formidable Moghal

Emperor Aurangzeb. Finally, to weaken the Maratha kingdom, Aurangzeb released Shahu, the son of Sambhaji, in the hope that his return to Maratha politics would weaken it through a split. Indeed, after the return of Shahu, the Maratha kingdom did split up with the major part going with Shahu who was based in the city of Satara, and the remainder centred around Kolhapur under the leadership of Tarabai. The Satara branch blossomed into the great Maratha empire, thanks to its illustrious prime ministers (called the *Peshavas*) who, in the heyday of the empire, could boast of sovereignty over most of North India. The Kolhapur branch remained confined to its modest boundaries. Ironically, the Maratha empire of Peshavas gradually collapsed and was taken over by the British, while the Kolhapur state was left intact as it was deemed too small to be a threat to the British rule in India. Thus Kolhapur continued to have a royal family, tracing their lineage to the great Shivaji. Also, the general ambience of the city was somewhat different from that of its neighbours like Satara or Pune in British India.

Both my mother's and father's families had been residing in Kolhapur for several generations. My mother's father, Shankar Abaji Huzurbazar, had been adopted into the Huzurbazar family from his original Shrikhande family. Indeed the practice of adoption into the Huzurbazar family from the Shrikhande family had taken place for several generations. As the name may suggest, the word 'Huzurbazar' meant 'In charge of shopping for His Highness', indicating a post held in the royal court of Kolhapur. The title carried forward, and its holders retained this surname, although the post itself ceased. Indeed, my maternal grandfather had been a teacher in a local school.

But my grandfather, Vasudevashastri Naralikar, was a well known *Pandit* and preacher of the sacred texts. His discourses were considered to be very entertaining and informative, and in my young age I came across senior persons from Kolhapur who recalled this fact from personal encounters with him for, I never saw him. In fact, my father was only ten years old when he passed away.

\* \* \*

The Huzurbazars had a big *Wada*, at the entrance to the Bhende Galli near Shivaji Chowk. In my childhood days I recall visiting it in summer vacations and being pampered by a host of aunts and uncles. I had five *mamas* and two *maoshis*. My mother had been the second child in the family, and her elder sister (whom we called *Akka*) was married at a comparatively young age and her family lived just across the lane.

Being the second eldest girl in the family, my mother was called ‘Tai’ by her family, a name which became common outside too and even my father addressed her as ‘Tai’ and so did I and my brother when we appeared on the scene. The only change that took place in this appellation came much later when my daughters started calling her ‘Taji’, short for ‘Tai-Aji’ (Aji means grandmother in Marathi).

In contrast to Akka, Tai displayed scholastic abilities at school, and contrary to the custom in the 1920s and 1930s, she was encouraged to study in college and take her Master of Arts degree in Sanskrit from Bombay University. Her younger sister Kusum-maoshi also went into higher education and was principal of the Maharani Laxmibai Girls School as well as the Vidyapeeth High School in Kolhapur. The uncles were also high achievers; the eldest Govind (*Dadamama*) retired as an Electrical Engineer with the Tata Power Company. The next Narayan (*Nanamama*) went into the legal profession and retired as a Magistrate. The next two, Vasant and Moreshwar, turned to Mathematics. *Vasantmama* was the Professor and Head of the Department of Mathematics and Statistics at Pune University for several years and spent his final years as a Professor of Statistics in the University of Denver, USA. Morumama was an algebraist and an extremely dedicated teacher of mathematics, who retired as the Director of the Institute (formerly the *Royal* Institute) of Science in Bombay. The youngest, Mukundmama, was Chemistry teacher in one of the Kolhapur colleges.

The Narlikars had a more modest *Wada* on the main thoroughfare of Mahadwar Road, not too far from the great gate (Mahadwar) of the famous Ambabai Temple in Kolhapur. I am told that the Wada had been bigger than the shape I found it in, having been trimmed off in the process of the road widening programme of the Kolhapur Municipality. My father, born in 1908, was the youngest of three brothers, and the brightest. Although, as mentioned above, he lost his father at a young age, he was encouraged to carry on his studies and topped in his school examinations while standing fourth in the statewide matriculation examination. He was sent to Bombay for college studies, first at the Elphinstone College and then at the Royal Institute of Science. He topped the B.Sc. list and his name is inscribed on the Roll of Honour at the R.I.S., followed by that of another illustrious alumnus, Homi Jahangir Bhabha. After B.Sc., he left for Cambridge to do the Mathematical Tripos followed by research. He returned in 1932 to take up the offer of a Professorship in Mathematics at the Banaras Hindu University, from no less a person than the Founder Pandit Madan Mohan Malaviya. I will have more to say about him later.

My parents were married on June 21, 1937, at Narsobachi Wadi on the banks of river Krishna. Although my parents were living in the campus of the B.H.U., as per practice commonly followed, my mother had come to Kolhapur to her father's house for my arrival. I was 'delivered' in the Dabholkar Nursing Home. After spending a few months in Kolhapur, I was brought along with my mother, to Banaras, where my childhood days began.

\* \* \*

The B.H.U. campus stands at the southern end of the holy city of Banaras, about a mile away from the river Ganges. The story told is that in planning his new university, Malaviyaji had been inspired by the famous universities of Oxford and Cambridge, both of which have rivers, Isis and Cam, flowing through them. He therefore planned the B.H.U. on the banks of the Ganges and the foundation stone of the university was laid accordingly. However, as far as size goes, the Ganges is in an altogether different class than the Isis or the Cam, and that very year (1916) there was a huge flood which inundated what would have been the campus of the proposed university. So Malaviyaji was advised to move the campus to a discrete distance from the river and wisely he did so. Even in its present position, once in a few years the floodwaters of the Ganges cross over into the university campus. I recall in my childhood days seeing people navigating in boats near the main gate of the university, although the damage caused by the floodwaters is not very severe or of a lasting nature.

The campus itself is well laid out and occupies an area of approximately 1300 acres. It is one of the largest university campuses in India. Today it looks very full with college buildings and staff quarters. In my childhood in the 1940s it was considerably empty, but still impressive looking with the large colleges and hostels with temple-like tops. The industrialist family of the Birlas had plans to build a large temple in the campus, to underscore the Hindu culture of the university. In my childhood the plans were made, but they fructified some twenty years later.

Although Malaviyaji was alive till 1946, he had become frail of health a few years earlier and, anxious to see the university in scholarly hands, had succeeded in inviting the distinguished philosopher Dr Sarvapalli Radhakrishnan to be its Vice-Chancellor. Although Dr Radhakrishnan occupied the post for some eight years (1940-1948), he also had other commitments to fill, including Vice-Chancellorship of Calcutta University and Professorship in Oxford. Still, his mark on the academic atmosphere as well as the

administration of the university was profound, and many recall that era as the golden age of B.H.U., especially its role as a national institution of learning.

It was the reputation of the university that attracted academic staff from all over India, and in turn attracted students also from across the country. Accordingly there was a multi-cultural ambience about the place, not only in terms of ‘associations’ or ‘mandals’ of persons (students and teachers) from different provinces and states, but also having different ‘messes’ for feeding students of different regions. It should be recalled that during the British rule, the university did not receive official patronage or grants and had to manage on private donations, which Malaviyaji was successful in attracting thanks to his missionary zeal. Still there was always awareness that money was in short supply and therefore only those driven by academic idealism were mostly to be found on the campus. During the 1942 “Quit India” movement, the university was a source of strength to the freedom fighters and, therefore, looked at with suspicion by the Government of United Provinces. Indeed, on one occasion, the Governor of U.P. wanted to send troops into the campus to probe and curb ‘anti-national’ activities, but refrained from doing so when the Vice-Chancellor firmly refused to have police inside the campus. The prestige and dignity that Dr Radhakrishnan commanded made the Governor back down. The present situation in many of our university campuses (including the B.H.U.) unfortunately presents a stark contrast to the above picture. I recall being in a V.C.’s office as he desperately pleaded with the local police chief to send in reinforcement to curb possible student unrest. I will return to this perplexing issue towards the end of this book.

My earliest memories are set against this background.

\* \* \*

Our house was large by the present day standards of university staff quarters, which were then labeled *A,B,C,...* etc in decreasing order of size. Ours, though a *C*-type quarter, had eleven rooms not counting garage, kitchen, bathrooms, servants’ quarters etc. The garage was meant for a car, but as cars were very rare those days (there may not have been more than five in the entire university), and my father decided not to have one, the garage was put to the use of storing firewood. Firewood was needed to heat water, and there were special large containers for heating bath water on wood fire. The garage would be filled with wood and the suppliers would deliver it on camels. I recall a caravan of camels marching in every few months carrying firewood which would be

unloaded and weighed before being stored in the garage. The entire operation could take a whole morning, but was fun to watch.

In the early times we slept on the first floor of the house. I used to wake up listening to the *abhangas* of the Marathi saint poet Tukaram being sung in a soft voice by Tai. If I got up early enough, I would see my father exercising yogic *asanas* and the *suryanamaskaras*. I would admire his well-built body and notice how thin my arms were compared to his. Indeed those days my father, had set aside good time for exercises, walks and badminton. Soon after moving into the house he had a concrete badminton court built at considerable expense. As this was the best court available in the university, many college students used to come and play there. I was thus able to watch good players not only from the university but also from outside including would-be national champions like T.N. Seth from Allahabad.

My father was also an avid book lover. Our house had cupboards full of books in practically all rooms. These were books he had borrowed from the University Library or purchased from bookshops or book-vendors who occasionally made house calls to sell their wares. One of my earliest memories is tied up with one of these book-almirahs which had glass doors. My brother and I were practicing long jumps on a mattress kept on floor adjacent to this almirah. I probably exceeded the expectations of my ability and my jump sent my right leg crashing through the glass door of the almirah. I was taken to the University Hospital where a doctor took out pieces of glass from my bleeding foot. It did hurt, but I recall being more frightened by the surgical instruments used by the doctor than by the pain itself. My foot still carries the mark where glass had penetrated rather deep.

My brother Anant (younger by two years) and I were taught and encouraged to recite Sanskrit shlokas selected by my parents. I recall that when we started learning the Bhagwadgeeta by heart, we were given a reward of one silver rupee coin (which carried the face of George VI) for each shloka memorized. There was a safe in the house and our hard-earned cash was kept in two piles there. There were occasions when, having run out of various “time pass” activities, we would ask Tai to open the safe so that we could inspect our treasures and check that they added up correctly.

I also remember both of us being taken by Tai for long walks in the quiet university campus. There were favourite spots for such walks, one being a small Hanuman temple. We would walk up there and recite the prayer to Lord Hanuman, from the *Ramaraksha*: “Manojavam marutatulya-vegam...” Later, this small temple which had deities in the open air, was rebuilt by

Dr B.G. Ghanekar, a specialist in Ayurveda who was a devotee of Hanuman. Thus the gods were at last given a better shelter. Dr Ghanekar had the unique record of having walked all the way from Maharashtra to Banaras to join the university in response to the Founder's call to scholars all over India to join as teachers.

A second spot for our walks was what we called "Douro-Douro", meaning in Hindi "Run-Run". This was an amphitheatre-like building which was used for university-convocations. It was built like the arc of a circle with steps along the arcs providing seats. To us 3-5 year olds, it provided plenty of space to run horizontally at the same level or vertically up and down. Except for the occasional convocation or public lecture, this vast place was always empty!

The one occasion when I saw that it was not empty, but overflowing with humanity, was when Tai took us to the special convocation where the special guests were none other than Mahatma Gandhi and Jawaharlal Nehru. I did not see Gandhiji, but could catch a glimpse of Nehruji sitting on the dais. It was still a few months to the "Quit India" call by the Mahatma, but the political temperature of the country was rising. So, the crowds were large and the presence of police vans indicated that the mobs could get unruly. So Tai decided to return home without attending the full ceremony. As this was the year 1942, I was barely 3-4 years old at the time.

We used to go for boat-rides on the Ganges and my earliest recollections are tied up with a visit to Ramnagar across the river. I do not recall the festival that we went to watch; but it provided an occasion for a procession including Kashi-Naresh (The Maharaja of Banaras) riding an elephant. He had his palace in Ramanagar.

Another early childhood memory is of a large "Yajnya" or a sacrifice that was conducted close to but just outside the University premises. There was a big crowd; perhaps we had lunch hosted by the organizers; but a lasting memento of the occasion was a pair of stone elephants which Tai bought for us. As we had walked all the way, my memory is of returning home very tired.

A favourite haunt for us kids was *Shivaji Hall*, a large building housing the university's gymnasium. We were fascinated by the various contraptions there and gradually came to try a few that were within our range. I later became a regular user of the facility and recall with affection the instructors there like Mr Deonalkar, Mr Mony Roy and Atin Babu. Here too Dr Ghanekar left his mark. Being an admirer of the legendary Shivaji, he donated funds to finance a bust of Shivaji in front of the *Shivaji Hall*.

I will conclude this chapter with my first day at school, an experience that is still green in my memory. In contrast to the present day tensions that

parents have to undergo to ensure that their child does get admission to a good school, the situation those days was much more relaxed. There was a small school in the campus of the university, meant for the children of the faculty, employees and other residents in the campus. Known as the University Children's School, it catered to kids from the 'infant' (pre-first) standard to Standard VI. It was co-educational till Std IV, and thereafter, the girls had to look to some other school in town just as the boys were required to do two years later. My father decided that at the age approaching five, I was old enough to be admitted to the infant Class.

So in the year 1943, on a partially rainy day in early July, my parents and my brother accompanied me to the school. After a brief talk to the Headmaster, I was admitted and taken to the 'infants' class. Children were sitting on carpets on the floor, each with a 'chowki' (a coffee-table like piece of furniture) which served as the writing desk. I was given one by the teacher, a benign lady whom we called '*Bahanji*' (Older Sister). After I was so admitted, my parents said good-bye to me and left along with my brother. It was then that I realized that I was on my own. I can still feel the sense of forlornness that crept over me on seeing their backs. It is a feeling every child from a happy home gets on the first day at school; but in my case it disappeared soon when Bahanji got me interested in some creative activity along with some other kids.

Bahanji was in full time charge of the infants class; a responsibility she handled well. Thus kids new to the school learnt to like it, thanks to her efforts through the year. My contact with her, however, was of rather a short duration, for it was decided within a couple of months that at my level of competence, I should be promoted to the next (First) Standard. I was too young to appreciate this 'honour', but recall being sad at missing Bahanji's company. Nevertheless, she kept in touch with me for several years and always showed her joy and pride at whatever successes I achieved later in life.

## SCHOOL YEARS

DISTANT impressions of school days can be of variable flavour, ranging from the ‘unhappy-and-best forgotten’ type to the ‘happy-those were the days’ variety. Although reality invariably brings a mix of the unhappy with the happy, in my case the overall impression leans towards the latter.

Consider to begin with, the fact I already mentioned in the last chapter; viz., there was no pressure of numbers making school admissions difficult in those days. A rapid rise in population coupled with a greater desire or compulsion for school education in the last five decades, has increased demand far outpacing the growth in the number of schools. The result is, the schools today are larger in size, with a large number of students (typically above 60) per class. Most have to adopt some criteria for deciding whom to allot the precious ‘seats’. So parents have to queue up to get admission forms, appear in interviews with the school authorities, and sometimes pay huge sums by way of ‘donations’. To strengthen their ward’s case, therefore, the guardians may have to get letters of recommendations from important personages or officials. These pressures may reflect on the child too, who has to be ‘coached’ to answer the likely questions from the Principal. In short, what should be a relaxed introduction to academia for the new entrant, ends up being a rat race.

Compared to present day schools of 3000 students and up, running in multiple shifts, my school had at no time more than 350 students altogether over the 1+10 classes that it ultimately grew into. Our class never had more

than 30-40 students, throughout my decade-long career. Another aspect in which I was more fortunate than today's school goer was in the time spent in transport to and from the school. Our school was within easy walking distance, taking around ten minutes of brisk walk. In contrast, the modern child already gets lessons in having patience and energy for commuting to work, taking a long time in the school bus or an overcrowded auto-rikshaw. Nor were our school satchels as heavy as the loads that the present generation of school kids has to carry.

Thus it was that my brother and I would sit down to lunch at around 9.45 a.m. and be in a position to walk up to school well in time for the 10.25 a.m. opening. There would be 'attendance' recorded in each class, followed by a brief but all school prayer session. The periods were of 40-45 minutes duration with two recesses, a short recess of 10 minutes and a long one of 20 minutes. We would saunter back home by around 4.15 p.m. for an afternoon tiffin followed by an hour or so of outdoor play at home.

Another bane of today's educational scenario that we were blissfully immune from was the necessity to attend private coaching classes. There indeed was a time when my parents had arranged private tuition for me at home: a teacher from our school used to come for an hour. This was in the early years when I had received double promotion and needed to catch up on what I had missed in the upper standard. Otherwise, my school studies were left to my own efforts. Today the typical school child has to spend hours supplementing what little the school teaches, by going to private coaching classes. The pressure on the child to attend these classes comes as much from an inferiority complex (mostly of parents, not of the child) that success in the exams critically depends not on the individual student's efforts but on professionally provided coaching. This belief comes from insufficient attention from teachers at school, which may well be due to the largeness of a typical class and an overburdened curriculum. I will have more to say on this aspect later.

\* \* \*

I have an early recollection of returning from school with my father in a (cycle) rikshaw on the day the result of Standard I were declared. It was a hot day in late April and the time around mid-day, thus making walking an ordeal. Even the rikshawallah was slow and lethargic. My father took out my result sheet and read out my marks in different subjects. In the end he told me that I had stood eighth in class. I do not recall any comment from him on my standing, whether he was happy with it or not. Nor do I recollect my own feeling on

hearing the result. Certainly, I was too young to have a meaningful reaction. Perhaps my father let it go at that because he felt that since I had been given a double promotion that year (from the ‘infants’ class to Std I) it was unfair to expect anything much better from me at this stage. But I do recall my parents’ obvious delight a year later, when I was declared as having stood first in Std II. It was only then that I realized that standing first is something to be proud of and that I should strive to maintain that position. Indeed, I may say that this was the beginning of competitiveness in me with the growing awareness that if I wished to maintain the top rank, I will have to work hard to maintain it. My parents, especially my mother, impressed upon me the need to keep my ‘top’ position intact.

But, alas, the path to glory is not easy, as I discovered shortly. I had a relapse, however, the very next year. At the time of the six-monthly examination of Std III, I fell ill and was out of circulation for several weeks. By the time I was declared fit to go out, most of the examination was over. Ironically, the only subjects whose examinations were still to take place, were drawing and music, neither being my strong point. Later, I did very well in the annual exams, but since the marks of the six-monthly exams were added to those of the annual for deciding the overall result, I could not score the highest, although I still was only four places down. In subsequent years, however, I did not relinquish the first position, although on several occasions I faced a strong challenge from my good friend Anantha (Dasannacharya) who always stood second in class.

This ‘preeminence’ identified me (somewhat wrongly I think) as a book-worm. Certainly I liked books, read a lot both as part of my studies as well as stories and other literature well beyond the school syllabus; but I also enjoyed sports, both watching and playing.

\* \* \*

Our school had a large playing field and there used to be occasional matches in cricket, hockey and football. I rarely took part in them, although at home my brother and I had several school friends from our neighbourhood coming in to play these games in the reasonably spacious play area available in our house. My father had bought us a full cricket kit, hockey sticks, football, table tennis bats and of course badminton rackets. By way of encouragement for us to be able to bowl well, he initially announced a prize of Re 1 for knocking the leg or off stump, and of Rs 5 for hitting the middle stump!

However, his own personal favourite was badminton, and as I mentioned

earlier, he had a concrete court erected in our house. Anant and I naturally developed liking for this sport too, and acquired considerable proficiency in it, at least as much to be able to win a few prizes in the local junior badminton championships. Our main opponents were the Chandola brothers, Anand and Lalit, who later advanced much farther in their career as badminton players. We generally played on our court in the morning, with I partnering Mother while Anant partnered Father. The afternoon was usually taken up by the university players who came to play on our court. While Father played with them regularly, we sometimes watched and occasionally played too.

Father was very generous with recreational aids. Packs of playing cards, board games like snakes and ladder, monopoly, etc., the bagatelle, carom, mecano sets, he was a veritable source of them. Naturally we had a lot of boys drifting in to play. On one occasion, we saw a performance by 'dombarees' (street acrobats) who walked on long poles tied to their feet. Could we do that? My mother got a carpenter to make a pair of poles, each with a pedal for putting a foot attached at a height of about half a meter. Anant and I would 'step' on this contraption and walk with the poles held in our hands. We could not only walk on level ground this way, but also acquired skill to mount stairs, and (more difficult!) descend them.

At a younger age, we were taken to see the movie '*Rama-bhakta Hanuman*' and were so enthralled by the screen adventures of the monkey god, that we wanted to repeat those tricks. While a monkey mask could be made with relative ease, how could we acquire a tail that rose up behind? Mother found a solution to that too! She got the requisite shape made by wire and had it covered by rope. The contraption could be worn round one's waist. I am citing these examples to show that our parents had considerable time for our recreational hours: again a plus point compared to the modern school-going kid. What about studies? I will return to this topic later.

At school, there was an annual day of sports with various races and other athletic events. I participated in some of these, but my main forte was the so called 'arithmetical race', in which one ran short stretches to pick up tricky problems, with the condition that one could run the next stretch only after solving the problem for the stretch. I invariably won this event.

There were also 'antakshari' competitions in which each side has to recite a verse beginning with the last letter of the verse recited by the opposite side. I recall that we fared miserably in one such competition between different classes and our Class Teacher was very annoyed. He advised us to regroup with each boy assigned a particular letter or a small group of letters and asked to memorize

verses beginning with those. This strategy worked and we came on top in the final competition.

However, that was for antakshari of Hindi verses. When it came to Sanskrit antakshari, my store of Sanskrit shlokas learnt at home made it possible for me to carry along the whole class single-handedly. I recall that in the final of this competition we beat the class next higher than us with great ease and the Guest of Honour Mr Ram Kumar Chaube, who had the distinction of having acquired no less than 15 Masters of Arts degrees in different subjects, patted my back and encouraged me to recite more verses for him.

There was of course a variation in the standard of teachers that taught us, in the interest they took in the curriculum, the encouragement they gave to individual students, and in the way they tried to get us interested in nature. But there were some dedicated teachers who went beyond the normal expectations and made special efforts in their teaching.

I still recall the day while I was in the secondary part of the school, when our mathematics teacher did not show up. The Headmaster sent a teacher named Ramnath Mishra from the primary section to hold the class. This gentleman hailed from a local village and was rather unsophisticated in his manners and pronunciation. So all of us students were ready to make fun of him. We also had poor expectations of his ability to keep us absorbed with problems at ‘our level’. However, here he had the last word. For, he set us a few simple looking problems and challenged us to solve them. He said, by way of a hint, that all those problems could be solved by using simple arithmetic.

Nevertheless, believing that arithmetic was primary level stuff and to ‘show off’ our skill some of us (including myself) used algebraic methods and soon got entangled in ugly looking equations. When we could not deliver the solutions with five minutes to go before the end of the period, he showed us how to solve them with simple arithmetic. He chided us for having forgotten the power of simple arithmetic after advancing to a higher class. This episode, besides giving a much needed blow to my ego, also brought home to me the importance of an elegant solution to a mathematical problem, regardless of the methods used. I wish I could remember all the three problems Mishraji had set us that day. I recall one which ran along these lines:

*A man left his house between three and four in the afternoon returning between seven and eight in the evening. He observed that the hands of the clock in his house had interchanged their places at the instants of his departure and return. How long had he been away?*

In today's overstuffed syllabus, the stress is on assimilating knowledge at the cost of comprehension. This is a grave mistake. Information *per se* can be acquired from various resources like the dictionary, the encyclopedia, and in modern times, the websites. To process the information comprehension is necessary. By simply memorizing (mugging up !) the information one does not appreciate its use and necessity. Yet this is what the modern school syllabus and the modern teaching methods wish the student to do. Take the following example. [It is based on my eldest daughter's experience when at school.]

A student in Std I is asked to write the following line ten times as part of his/her homework:

*The Sun rises in the East and sets in the West.*

If the child makes even a slight deviation of the arrangement of words or expresses the fact in different words, he/ she is told off. Yet the sentence is more profound than what it conveys. It raises several questions. Where does the Sun go when it sets? Wherfrom does it emerge when it rises? Is it the same Sun that rises the next day? Shouldn't the child be told something of this exciting story? More importantly, if the child asks these questions, shouldn't the teacher answer them? A better teacher will indeed ask these questions herself if no child in class asks them. However, with a heavily laden syllabus to complete and an overcrowded classroom to teach, the teacher has no time to pause and encourage the pupils to think and debate.

I was fortunate that at least a few teachers in my school had time to encourage comprehension of what they taught. A mathematics teacher encouraged alternative proofs of geometrical propositions, a Sanskrit teacher liked to pause and discuss the beauty of some shlokas, or the science teacher had time and interest to carry out a lecture-demonstration with an experiment. I still recall the thrill I experienced when the teacher made a siphon-tube to transfer water from one receptacle to another. Until he explained the principle behind the phenomenon, it looked like magic that water from a source rose above the starting level before falling into the container. No amount of reading and rereading the science textbook would have captured that thrill.

In my half-yearly examination prior to the final matriculation (Std X) examination, I wrote a different proof of the famous Pythagoras theorem, a proof that I had discovered myself independently and which was much shorter. While giving me full marks the teacher, however, cautioned me against using this proof in the final examination, if the theorem were asked to be proved

there. "Why, Sir ? Is my proof wrong?" I asked somewhat dismayed. He replied "No, the proof is correct. But the examiner in the final board examination has a lot of answer scripts to check. If he sees an unfamiliar figure in an answer book, he does not have the time to check that the proof is correct...he will think that since the figure does not look like the textbook figure, the proof must be wrong." This episode speaks for itself and is a comment on our examination system. Indeed I was to be a victim of another invidious aspect of how our examinations are conducted; but I will defer mention of the episode to the end of this chapter.

Perhaps I should mention that at some stage, when I was to move from the primary to the secondary school, my father was asked by several colleagues if he would not place me in a more sophisticated English medium school. One of my friends had joined a boarding school in the hill station of Mussourie, while some others had joined other well known schools in Banaras city. My school was of the quiet backwaters type. It was growing in size by extending its highest class year by year. Thus when I was in Std VI, the school extended up to Std VIII; when I reached Std VIII, the school had its first batch in Std X, and was preparing that class for the university matriculation examination (called the Admission Examination). So the school did not have long traditions, but was creating them through its new batches. Despite these aspects, my father opted for continuing me in the same school, partly because, he felt that the school was closer to our grass roots, whereas a sophisticated school in Mussourie or Dehradun would expose me to the rather limited upper strata of society away from the grass roots.

I do recall chatting with my friend who had changed over to the Mussourie school, about the medium of conversation. To my question about whether students talked to one another in Hindi, he replied: "Oh No! If you spoke Hindi you would be slapped." I was shocked at the way our national language was being treated and personally relieved that my father had opted to continue me at my existing school.

Today there is a great demand by parents for the so-called English medium school, in the expectation that their children will be familiar with the upper-crust of society which will stand them in good stead. I beg to disagree. Certainly I did not lose out in any way by continuing in my Hindi-medium school; rather I feel that I was brought up closer to the mainstream of Indian population. Further, it is the case that when you teach a subject to a pupil in a language other than one he or she commonly uses, the pupil has to exert extra to comprehend the subject matter. Very often the pupil simply memorizes without

understanding. Thus in Banaras I was very comfortable with Hindi and could grasp the scientific facts more easily because they were expressed in Hindi.

When I look back on my school days I have naturally a mixed bag of memories...although by and large they are sweet, there are some sour ones too. Like the day when in Standard IX, I think, in my capacity as Prefect I slipped in my duty. That day the drill-master had not come and his was the last period in the class. Custom was that students waited in class for him to show up and lead us all on to the field. That day we waited for about five minutes and then I sent a boy to find out where he was. He brought the news that the master was on leave. So the general consensus was that there would be no drill without the drill master, and as his was the last period, we might as well pack up and go home. The consensus prevailed and as a prefect I okayed it, following which, everybody including myself, left. We were all delighted to have an extra half hour for play at home.

The delight was, however, short-lived at least as far as I was concerned. The next day at school, I was summoned by the Headmaster. Apparently, a few minutes after we all left, he had himself come to take the drill class only to find the classroom empty. Why did we leave the school? He asked. I replied describing the consensus reached the previous day. "Consensus amongst students does not constitute authority...Why did you not seek the permission of the Class Teacher or myself?" He asked. I had no defence against the argument, of course. But then came the comment that hurt: "Jayant, I am disappointed in you as Prefect. Surely, with the authority given to you to manage the class in the absence of a teacher, you also carry extra responsibility! Other boys may have decided to go home, but you at least should have come and consulted me. Instead you also left with them. Remember, in life authority always comes with greater responsibility."

Although he let me off with no punishment, I was deeply sorry at my lapse. But what he told me has remained engraved on my psyche ever since.

The same Headmaster (Mr Brij Bihari Lal Varma) had been a source of inspiration to many of us. He had evaluated our examination scripts in Hindi in the half yearly test in the final year. This test was considered an indicator of how we would perform in the final Admission Examination conducted by the University. In my case, he gave me some 65 marks out of hundred, commenting: "At this rate Jayant will not get a distinction (75%) in the Admission Examination." He explained to me where my answers had fallen short of that extra merit which raises a first class to distinction.

Although this may sound a negative comment, it raised for the first time

in my mind the hope of getting a distinction in Hindi. Till then all of us students had assumed that getting a distinction in a language like Hindi was next to impossible. To our knowledge, this feat had not been achieved in this examination till then. Indeed, we used to joke that the Hindi examiner pockets 25 marks first and then evaluates the paper out of the remaining 75! Still, Headmaster's remarks served as a challenge to me to put in an extra effort to try for that rare distinction.

We got a preparation leave for a month or so prior to the examination. On the last working day, we, the X-Graders were given a send-off by the IX-Graders along with the teachers. All of us received a garland and a 'fish-pond' each. Mine was the proverb: "Handsome is as handsome does". There were a few speeches and a group photograph. As I look at the photograph today, I wonder where each and every one of us is today, if still alive. I have kept in touch with about 5-6 only of my class-mates. Most of the teachers are either retired or deceased. But the photograph evokes largely pleasant memories. I particularly recall, apart from Headmaster Varma, my first home tutor Pandeji, the Sanskrit teacher Kotishwar Bhattacharya and the Hindi teacher Girija Shankar Gaur who also had cricket reputation as a good batsman. But alas, whenever I watched him bat in a school event he would get out soon!

Our school being a small one and a recent entrant to the Admission Examination system, had not yet produced a topper. This privilege generally went to the Central Hindu School, which was a large school and had been around for many decades. Still, there were many teachers in school, including the Headmaster, who believed that this year I would bring that honour to the school.

I do not recall being under any pressure from that angle, as I prepared for the examination. There was, however, a setback in terms of my health which till then had been excellent. I developed a chronic stomach ache. All available tests failed to find the root cause. Eventually, Dr DasGupta, a Homeopathic expert suggested trying Isubgol, a plant whose stems were to be boiled in water and that solution to be consumed. It did help, and I was free from these pains by the time the examination started. Little known those days, today Isubgol is a well recognized medicine. The stomach-aches made it difficult to concentrate on studies, however, but as I had been preparing the courses all through the year, I was reasonably well prepared for the exams.

I still recall the day when the results were announced. Vasantmama, my statistician uncle, happened to be staying with us for part of the summer holidays and it was he who was the first to congratulate me for standing first in the admission examination. I thought he was joking since the result did not sink in first; but

when it did, I recall asking him in what subjects had I got distinction. He did not know since he had just had this news from the examination office on phone. When we called the office again to get the answer to my question the officer there replied: "Mathematics, Sanskrit and Hindi". My first reaction was immense pleasure at getting a distinction in Hindi. But this pleasure soon became tempered by the sobering thought: Why had I missed distinction in science?

The mark-list which arrived later, revealed the answer. I had got very good marks in Physics, both theory and practicals. I had also got excellent marks in Chemistry theory; but in the Chemistry practicals I had scored only 8 out of 25. This had pulled me down so that I missed distinction in the overall subject (Physics + Chemistry) by just three marks.

My father was out of station in Bombay, when my result had been announced. I met him at the Moghalsarai station when he arrived on the Bombay-Calcutta Mail. He was happy with my getting the first rank and very pleased that I had managed the rare feat of a distinction in Hindi. He consoled me on my dismay at missing the science distinction by saying: "Never mind! You will have ample opportunities for doing well in science."

I later asked my father, if it was worth applying for a recheck. He discouraged me from it as it was a practical test and as such the script would not give much help. "It is good enough that you have stood first and have three distinctions. Personally I value your distinction in Hindi more as you appear to be the only one to have got it." I left it at that, although there was a nagging thought as to why I had performed so badly as to barely pass the practical for which the threshold for passing was 30%.

Many years later I got the resolution of the mystery. On a visit to my school from England in 1965, I met the same Headmaster, who had done his own sleuthing. He told me that there had been a conspiracy to fail me in the practicals and the examiner had been 'persuaded' to give me low marks so as to fail me. The reason for this action was to ensure that another boy tops the examination. It had been hoped by the perpetrators of the deed that by failing the practicals I would fail the subject examination and that in turn would lead to my failing the entire examination. The plotters had felt that that was the only way I could be prevented from standing first. The examiner probably thought that the passing threshold was 33% and so gave me 8 marks. Varmasahib explained to me in conclusion: "Jayant, you were lucky that the passing percentage was 30 and not 33. Thus you just managed to cross the line!" Thus, I seem to have narrowly escaped from failing. Indeed I can't imagine a finer difference than one mark between failing and standing first!

## FAMILY LIFE IN BHU

MY memories of growing up years are naturally linked primarily with my parents. By the then standards, our family of four was a small family. More common in those years, the typical Hindu family could have paternal grandparents, aunts and uncles, etc., residing together as a joint family: as was the case on my mother's side. Thus my brother and I did not have the luxury of having grandparents residing with us. As mentioned earlier, my father had lost his father when he was only ten, and his mother also long before he joined the Banaras Hindu University.

Thus the seniormost authority in our house was my father. He had the nickname 'Tatyā' common in middle class Maharashtrian households for a younger brother; the title 'Dada' being reserved for the eldest brother. As the child grows older and commands respect, the name is changed to 'Tatyasaheb', as happened in my father's case. I do recall, however, addressing him as 'Tatyā' until I was around five years old. Later Mother encouraged me (and Anant) to refer to him as 'Tatyasaheb'.

One's father is a natural 'hero' in a boy's early life and mine was no exception. In a later chapter I will have occasion to review my impressions of Tatyasaheb. I have already written briefly about my mother and would like to elaborate upon the same later in this chapter.

Although we had a steady stream of guests and relations visiting us, a significant addition to our family was Morumama, who came to Banaras in 1950 to do the M.Sc. degree course in mathematics and stayed in our house

for three years. I will have more to say about him, and about his elder brother Vasantmama from whom also I learnt a lot.

The cross-section of visitors who came to our house is wide enough to be considered a fair representation of the educated and cultured picture of India in the 1940s and 1950s. It will not be possible for me to mention them all, but the sample chosen here will indicate the variety.

While talking about our life in Banaras, it is essential also to dwell upon our periodic visits to Kolhapur during summer vacations. As we grew older, these visits grew less frequent from being annual to biannual to once in four years.

And, finally, about that element in a middle class family life, that is becoming a rare commodity: full-time servants. We had a number of interesting characters in our household from time to time, which not only provided good service but also considerable headaches and aggravations. It is best to begin with a couple of anecdotes about them.

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When my father came to take up residence in the B.H.U. as a professor in 1932, he was given a spacious house and was naturally in need of servants. There was no difficulty in getting them. However, he was intrigued by one applicant for the cook's position. The man asked monthly wages of ₹ 10. However, he said that if in addition he were entrusted with the job of shopping for the food stuff, he would be satisfied with a monthly pay of ₹ 8 only. This puzzled my father, who enquired with neighbours who laughed at his naïve nature. They explained: "If you let him shop for you, he will make enough on the side to compensate for the lower wages."

One of the neighbours was more 'westernized' in lifestyle and his wife came and showed my mother how to make omelette with onions, coriander and, of course, eggs. After the demonstration, the cook came to know that eggs had been brought into the house. Although the demonstration had taken place outside the kitchen, the cook got hold of all the utensils that had come in contact with the 'unclean' eggs and sold them in the town and purchased replacements. Learning from this experience, we adopted the practice of purchasing the eggs on the sly and having omelettes without the knowledge of the cook or other servants. I recall, a lad of twelve used to bring eggs well wrapped in newspaper to be personally handed to my mother or to me at the side door. Years later, when I visited B.H.U., a young man came to see me

amongst other old contacts and acquaintances and talking of the old days mentioned that he was the one who used to deliver the clandestine eggs!

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When a bank or a credit card company asks as a security code, ‘mother’s maiden name’, a Maharashtrian has to pause to recollect it correctly. My mother, Sumati Vishnu Narlikar was Krishna Shankar Huzurbazar before marriage. The surname of a girl usually changes to her husband’s after marriage, although with the gender-equality movement getting stronger this may not continue automatically. So ‘Huzurbazar’ changed to ‘Narlikar’. The middle name is traditionally that of father, which in the case of a girl changes after her marriage, to her husband’s first name. So ‘Shankar’ changed to ‘Vishnu’. Then there was the custom, now becoming defunct amongst the educated classes, under which at the time of the wedding, the bridegroom can change his bride’s given name also, to one of his liking. So out went ‘Krishna’ to be replaced by ‘Sumati’.

Actually this was my father’s second marriage, after he lost his first wife Shridevi (*nee* Navare) a few years earlier to an incurable disease. Having been educated in Cambridge and having decided to devote himself to a life of teaching and research, he looked for a well educated bride. My mother, with an M.A. degree in Sanskrit and teaching in a Kolhapur school, was considered a good match and proved to be so. It is reported that at the time of their meeting when the marriage was arranged, my father asked her as to whether she had any special expectations of him. She said that she hoped that at least some of her brothers would benefit by associating with him in building a scholastic career. It was in response to this wish that my father invited Vasantmama and later Morumama to come to B.H.U. for their master’s degree in mathematics, as they had shown promise of a very bright career. They both did and justified the early promise by winning the Chancellor’s Gold Medal (for topping the list in all M.A./M.Sc. examinations in the university) in their respective years.

Tai’s academic interests rhymed well with those of Tatyasaheb, who was also a great fan of Sanskrit. He encouraged her to read more. However, when at one stage, Professor Belvalkar, a distinguished scholar of Sanskrit at B.H.U. offered to guide her as student for the Ph.D. degree, my father discouraged the proposal. He felt that Tai should devote her primary energy and time to bringing up children and managing the household; and if she did that, she may not have time for research. In today’s ambience of emancipation of women this argument may reflect a chauvinistic attitude; but in those days women going

in for a Ph.D. degree were extremely rare. I will return to this point at a later stage in this book.

Tai did follow this dictum conscientiously and gave an exemplary demonstration of a good wife, a good mother and a good housewife. There were numerous ways in which she ensured that her husband and children got the best that was possible. It would not be too much to say that all three of us were pampered!

Tai used her brains to devise several new arrangements for simplifying household chores. In winter, it would get very cold and it was a torture to put on cold clothes after a hot bath. So she devised means of warming clothes on a charcoal burner, which was placed in the bathroom. In the summer, with no refrigerator, she found means of keeping things cool through evaporative cooling. As I have mentioned earlier she had devised new toys for us to play with, having got them made by the carpenter. Although she came with excellent knowledge of Maharashtrian cuisine, she added to her repertoire inputs of the north Indian dishes that we found in Banaras. I recall my father announcing a prize of ₹ 100/- for frying fully round ‘golkappa’ or pani-puri and my mother finally qualifying for it.

Both Anant and I have to acknowledge that our liking for reading books started with Tai telling stories at bedtime. Earlier these stories were all about Indian mythology, Grimm's fairy tales, the Arabian Nights, etc. Later they graduated to Sherlock Holmes, Bertie Wooster, and other famous fictional characters, where she would read and narrate the contents in an improvised Marathi translation. Soon we developed so much liking for the literature that we could not wait till bedtime and started reading ourselves. Indeed, for introducing us to many gems from English, Hindi and Marathi literature, we are indebted to Tai for her bedtime narrations.

Although Tai had been very devoted to my father, she possessed an independent will of her own. There were occasions when there was a clash of wills between Tai and Tatyasaheb. These led to moments of tension and although we children were kept out of such clashes, I do recall feeling tense and unhappy while they lasted. Fortunately they did not last long. In retrospect they now seem like storms in teacups and sometimes as I look back on those events, I wonder how even very intellectual minds could clash on relatively petty issues.

One issue which dragged on for a few days concerned the badminton court in our house. Tai wanted to play one afternoon, but was not allowed to because there were students from the university playing with my father. Tai was presumably excluded as the standard of play was expected to be above her

level. Perhaps my father also was stubborn in laying down the rule that she could play only in the morning. The quarrel resulted in Tai stating her intention that she would get another court built for herself! She even called some civil-works contractors to get estimates for such a court. Fortunately the estimates turned out to be very high (around ₹ 1600 in 1948), much higher than the ₹ 100 or so that my father had spent for the court some fifteen years earlier. In the meantime, Tatyasaheb also cooled down and some mutually acceptable compromise was reached between the two.

Such incidents of disagreement, however, became rarer as time went on, especially after both Anant and I left for our studies abroad. Naturally, after both of us left, my parents felt somewhat lonely and therefore more appreciative of each other's company.

Tai was extremely kind to us both, and hardly a disciplinarian that our father was. She took special care of my brother's studies during the year he got a double promotion at school. I recall her painstakingly going through his homework as well as ensuring that he had understood his lessons well. But the extent to which she had been pampering us, was brought home to us during a visit by the renowned vocal musician Pandit Narayanrao Vyas.

Vyas-mama, as we used to call him (we affixed the word 'mama', meaning maternal uncle, to the name of senior male visitors to our house), was a popular figure in our house. He was senior to my father by several years and knew him from his Kolhapur days, well before his distinguished career in Cambridge. Vyasmama had been a pupil of the great Vishnu Digambar Paluskar and carried on the tradition of his teacher in North Indian Music. He was in great demand as a maestro for various musical occasions and conferences and as Banaras was a centre of classical music, visited there too. On such occasions he used to stay with us. We enjoyed his anecdotes of personalities, including imitations of their styles. So, when in 1948 we learnt of his coming, my brother and I were delighted. We eagerly looked forward to a week of entertainment.

However, on this particular occasion, a different experience was in store for us. After staying a few days, Vyasmama had a heart to heart talk with our parents. He had two grievances about us: firstly, we did not study as per any regular hours and, secondly, we seemed to be very heavily dependent on our mother in all our daily chores. In short, we needed discipline in our study and self-reliance in our routine daily jobs.

My father tried to argue that he accepted the need for self-reliance but as we were doing very well at school, he had not bothered as to how many hours we studied every day and whether we did so as per any time table. Vyasmama argued

that this was not enough; as we moved to higher classes the need for study at home to supplement what was taught at school would grow and it would be wise to initiate the practice of time management right away. To our chagrin, Tatyasaheb agreed and set us a study time table that required getting up at five in the morning and studying for four hours in the day. To be able to get up fresh at five in the morning, we had to go to bed at nine at night. Although we did not like it at first, the habit so formed came in very handy in later years.

On the issue of ‘self-reliance’ (*swavalamban* in Marathi) Vyasmama gave Anant and me a long lecture, besides telling Tai that she had been pampering us; that there were many daily chores that we must do ourselves, rather than expect her to do, like making our bed, tidying our study areas, keeping our clothes in place, etc. *Besides* we must be able to cook a simple meal ourselves. Having been rather lazy in this respect, we found Vyasmama’s intervention in our living pattern rather unwelcome. Had we read Shakespeare’s *Julius Ceaser* we would have said: “Et tu Vyasmama?” But in the long run, when we went for higher studies abroad, this self-reliance also came in handy.

Tai being a Sanskrit scholar, wanted me to know and appreciate some gems from the language. So she went over selected extracts from some of the Sanskrit masterpieces with me, like Kalidasa’s *Raghuvansham* and, *Abhijnanashakuntalam*, Bhavabhuti’s *Uttararamacharitam*, etc. She had already made both Anant and I familiarize ourselves with many well known Sanskrit shlokas. The result was that along with mathematics, Sanskrit became my favourite subject. I was indeed unhappy, when after the matriculation examination, I could not offer Sanskrit as a language in a science-dominated curriculum. My father also had been confronted with a similar choice between Sanskrit or Mathematics at precisely the same stage. Indeed rigidity about combinations of subjects to study at undergraduate level is a weakness of our university curricula. Why can’t we have a flexible choice system with credits being picked up by the student from the humanities as well as sciences as per his /her interests?

Tai also wanted us to pick up some new art or activity during the long summer vacations, and to this end arranged for us to have lessons in drawing and painting, sculpture, vocal music, typing etc., depending on the availability of facilities. Although we did not excel in any of these pursuits, it at least helped us to appreciate what these activities involve.

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As mentioned earlier, my two uncles had spent their M.Sc. years at our house.

Vasantmama was with us during 1940-42, and I have very vague recollection of him as I was too small. I do recall, however, that when I jumped into the glass door of the almerah, it was he who took me to the hospital. As I will describe later, my interaction with him was much closer and influential for me when I was preparing to leave for higher studies at Cambridge.

Morumama came to live with us in 1950 when I was in Std. VIII. By then I had already established a definite liking for mathematics. My father had given me several books of recreational mathematics to look at and the mathematical puzzles therein invariably attracted me, both for the mental challenge they posed and for opening out attractive new vistas in the subject. Morumama shared these interests and together we hit it off very well indeed. Morumama noticed that we had two wall blackboards, which we used to draw pictures, sketch geography maps or to write jokes. He decided to put them to another use.

One fine morning when I got ready to do my schoolwork, I saw that something was written on the smaller of the two boards in Morumama's neat handwriting. It was entitled: *Challenge Problem for JVN*. As I read through what followed, I discovered that it was a mathematical problem. As Morumama slept late at night, he had presumably written out this challenge before going to bed. The problem was not simple as I soon realized. Later when he surfaced, Morumama explained to me that I was to solve this problem all by myself. That is, I could look up books but not seek help from any person. If I managed to solve the problem I scored a victory. If I couldn't and gave up, then he would claim victory.

I recall winning that challenge. But this was only the beginning: the beginning of a long series of 'Challenge problems for JVN' which he wrote out on the smaller board for me to solve. These were tricky puzzles of logic, geometrical riders or algebraic problems. A typical challenge problem would remain on the board till either I solved it to his satisfaction or conceded defeat, which happened on relatively rare occasions. These problems not only made my wit sharper, they gradually raised the level of my problem solving ability. I am indebted to Morumama for these stimulating challenges in my formative years.

Morumama was a great fan of Sanskrit and with his presence I also enhanced my appreciation of the language. He would be great at *Vidamban*, that is modifying famous verses by Kalidasa, Bhavabhuti, Bhartruhari, Bhasa, etc., to derive humourous meanings from them. He was an original composer of Sanskrit shlokas too. Some of these abilities rubbed off on me so that I too began to indulge in these exercises.

As Banaras was, (and still is) a city with many attractions for tourists and pilgrims, we used to have a fair share of visitors, mainly from Maharashtra, in addition to the academics who visited the university for examinership or for selection committee work. In those days facilities like guest houses or hotels were minimal and middle class people preferred to stay with friends when on such visits. As we had a spacious house, and help from resident servants, my parents did not feel uncomfortable or inconvenienced when such guests descended on us, sometimes without much prior warning.

To drop a few names, we had literary figures like M.D. (*Ma.Da*) Altekar, N.S. (*Na Si.*) Phadke, and musicians like Narayanrao Vyas, Vamanrao Padhye coming to stay, P.L. (*Pu.La.*) Deshpande, Anant Kanekar, Deenanath Dalal dropping in for a chat, academics like Professors Vaidyanathaswamy from Madras, Ram Behari from Delhi, Thawani from Gauhati, A.C. Banerjee from Allahabad, N.R. as well as R.N. Sen from Calcutta etc. In many instances, whenever a distinguished visitor with appreciation for Sanskrit arrived, Anant and I would be summoned for reciting some shlokas.

I particularly remember two occasions. In 1948, Professor S. Radhakrishnan, who had relinquished the charge of Vice-Chancellorship of B.H.U. a few months earlier, was visiting the university on some official delegation. My father who had great respect for Dr Radhakrishnan and had enjoyed his confidence when he was the VC, invited the delegation along with some senior officials and professors of the university for a dinner party at our house. He had me and my brother rehearse the recital of Shankaracharya's 'Dashashloki' (an abstract philosophical view of God) with harmonium background. The idea was to sing from an inside room while the guests sat chatting on the badminton court before dinner. The performance went off marvelously and the much impressed listeners first thought that they were listening to a gramophone record. Later Dr Radhakrishnan personally congratulated us for reciting well with correct pronunciation of the complex Sanskrit, words. On another occasion, Chitamanrao (C.D.) Deshmukh, also a connoisseur of Sanskrit, was visiting us for lunch and we recited some shlokas for him, again receiving accolades from him.

Another distinguished guest at our house was Wrangler Appasaheb Paranjpye. As the doyen of wranglers (being himself the first ever Indian Senior Wrangler), he was a source of great awe and respect. Once when he visited us I was in high school and so well recall how we brothers had put on our best behaviour. Indeed it was a new experience for us to see even Tatyasaheb, whom we treated with great awe and respect, being very respectful to the Old Man.

We were delegated to accompany him on his walks in the university campus, and were struck by his interest in the flora and fauna. Often he would stop and ask us the local name of a tree and we would more often than not confess ignorance. But we found him very informal with us, certainly far less intimidating than what our father had made him out to be.

In fact I had distant memory of his earlier visit when he was accompanied by his formidable daughter Shakuntala Paranjpye and her daughter Sai. Sai is 2-3 years older than I am and there is a picture of both of us sitting on a relic stone elephant in Sarnath during this visit. However, we had been told various stories of how strong a disciplinarian Shakuntalabai was with Sai. Naturally we were in great awe of the lady. There is a story of my brother being asked by her, what she reminded him of and he replied with childlike directness: “Tadaka”, referring to the picture of the queen of demons in the Aundhkar pictorial edition of Ramayana! While my parents were reportedly very embarrassed (even they had to admit a certain similarity between the demon-queen and the lady with bob cut hair flying in all directions) Shakuntalabai was highly amused and, I believe, flattered by the description. Indeed, on later occasions, while talking or writing to us, she referred to herself as our ‘Tadaka maoshi’.

Incidentally, a photograph that has become our cherished possession, shows me as a year old baby in the arms of Wrangler Paranjpye at the Banaras Cantonment Railway Station. I was told that Tai was responsible for it. She would not have dared request the Old Man to hold me for a picture while my father was around. So she took the opportunity when he had gone to purchase the platform ticket and to enquire about the time of arrival of the train!

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As mentioned earlier, B.H.U. attracted students from all over India. Those coming from Maharashtra or those who were wards of friends of my parents came to have a special relationship with them. In some of these cases, the parents of a student would request my parents to be in *loco-parentis* with their wards. Arvind Bhalerao, Sharad Adke, Ghanshyam Thawani and several others in this category maintained close contact with us in later life. Several Maharashtrian names like Shrikhande, Pitre, Pendsay, figure in such a list. The focal point of this interaction was the morning breakfast on the Narak-Chaturdashi morning when after completing an elaborate bath, Anant and I indulged in dawn fireworks until the breakfast time when the ‘mama’ invites

began to appear. Jokes and anecdotes from them would then regale us while all of us enjoyed the Diwali delicacies.

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Rikshaws, Tongas, Ekkas and bund-garris were the main methods of transport those days. Motor taxies were available for special trips with prior arrangement of fare with the driver. The ekkas dropped out of circulation by the late 1940s, while tongas continued with diminished numbers. The bund garri, as its name implies, was provided with doors which could be closed for privacy. These have now become extinct. The cycle rikshaws continue to ply, although they now face competition from the scooter-rikshaws, the monstrosities that have added considerably to the pollution in our cities.

My early recollections of these horse-drawn vehicles include horses being rebellious and threatening to topple the ekka or the tonga, or at least their passengers! I was once trapped alone on one such ekka, where, after I was lifted and placed on the seat and before the adults could get on, the horse stood on its hind legs. Such occasions were rare, however.

A ride in a bund garri was regarded as a rare treat, something we kids looked forward to. One such occasion, however, led to a disappointing end to what otherwise was a perfect ‘outing’. After seeing a movie in a theatre in Godowlia, we took a bund garri all the way to the university. As we brothers settled down into our plush seats, the garri came to a halt. We heard conversation outside which progressively became acrimonious. My father stepped out to enquire the cause. It seemed the police had stopped our garri for an obvious reason: it carried no lamp. I still recall the intimidating tones in which the policeman asked: *Batti kahan hai?* (Where is the light?). The excuse offered by the garri driver that he had run out of oil of course did not hold water in the eyes of the authority. The episode ended by the policeman confiscating the driver’s license till such time as he paid the fine and also got the lamp lit up as per rules. The policeman got us two rikshaws to take us to the university as there was no other bund garri around. For us this was a come down indeed!

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We commonly used to go to the city (Godaulia, Dashashwamedh Ghat and Chowk areas) for shopping, movies or for boating on the Ganges.

The latter was more common whenever we had house guests who wanted to be taken on the city sight-seeing tour. This, of course, included the narrow lanes in the town meandering through shops of various types, the famous Vishwanath temple, the observatory (Man Mandir), and bathing on the ghats. Although several of our guests took dips in the holy waters, we never did; for my father while being well versed in the Hindu religion was an unbeliever in rituals. I developed a similar attitude partly initiated by his influence.

Two temples nearer to the university campus were famous: the *Sankat-Mochan* Hanuman Mandir, and the *Durga* mandir. I have a traumatic recollection of the latter, when I was barely four years old. The temple has a lot of monkeys and on this occasion when I had entered with some adults (probably my mother and Vasantmama), I was injudiciously wearing a garland. Probably I might have insisted that I must have a garland and they got me one to keep me quiet. But I paid for my stubbornness as a monkey came and sat on my shoulder and started consuming the flowers! It took some persuasion to depart from my shoulder.

The monkeys abound in the Sankat Mochan too. Here they set their sights on the *Prasad*, which are laddus made from a special dough that is simply delicious. To this day, my friends from Banaras know my weakness for these laddus...and bring some whenever they come to see me. However, a new visitor to the temple may be in for a similar experience with respect to the prasad as I had in the Durga Mandir! Sankat Mochan has been a favourite with the B.H.U. students, especially those who have prepared inadequately for their exams; for their belief is that Hanumanji will bail them out of this *problem or sankat!* We used to visit this temple often as it offered a nice park-like setting for an outing. Here too Tai and we two brothers would go to both the Hanuman and Ram mandirs and recite shlokas from the *Rama-Raksha*, while Tatyasaheb would be standing outside. We of course always bought some prasad for later consumption, guarding it from the predators on the trees nearby!

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Circus used to be another major attraction in town, and we used to go almost every time there was one visiting. The animal performances invariably impressed me, especially as I used to wonder how are lions, tigers, bears and elephants tamed and trained. In those days of no TV, such attractions carried great popularity. In the 1940s, one also looked forward to door-to-door showmen with performing monkeys and bears, as well as human acrobats walking on long poles, on long ropes tied across poles, etc.

Another major attraction for going out into the city was to eat in a restaurant. Our favourites were Idli and Dosa, either eaten in situ or delivered at home. I recall, that making advanced estimate of the bill was a favourite pastime of mine. As I knew the prices of individual items and liked doing sums in head, this was not a difficult job and I always turned out to be right. There were some occasions when the restaurant bill was wrong. I recall a few (rare and special) occasions when Tatyasaheb took us to the two major Western type hotels in the cantonment area, the Clark's Hotel and to the Hotel de Paris. On the first such occasion, when we ordered omlette, the waiter came back to double-check by asking "Will the lady also eat omlette?" It was generally expected that ladies would be vegetarian.

Longer trips invariably included Sarnath, the place where the Buddha preached his new knowledge to the first set of disciples. Although we normally went to Sarnath to take some guests there, sometimes we went there on a family picnic. The relics of two and a half millennia in the past, distributed over an open area of several acres, was a marvelous site for a visit. Those days the place was not as crowded as it is today. Our visit would begin by first acquiring a room in the Dharmashala set up by the Birlas there, so that we could have rest and food there half-way through the visit. The Japanese and Chinese temples of Buddha formed a striking contrast in terms of their quiet and peaceful atmosphere and overall cleanliness from the Hindu temples in the city, including the Vishwanath temple. The giant *stupa* and the archaeological remains in its neighbourhood were fun for us kids to roam around. The visit included the museum also where many relics are stored. On the way back, we stopped at the bottom of a hillock with a small structure at the top which hides a well, where the Moghal Emperor Humayun was reputed to have hidden when he was on the run after losing to Sher Shah Suri in an epic battle.

The Sarnath trip meant going in a car, since distances of the order of 15 miles or so could not be covered with rikshaws or tongas. So the planning would begin with the hiring of a vehicle, usually from the city centre. In the late 1940s, the typical cost of a whole day trip (say 8 a.m. to 5 p.m.) was no more than ₹ 12-14.

The other trip that we looked forward to was to the Moghalsarai railway station, again at a similar distance and therefore requiring a taxi. We did this

1. Now Kolkata  
2. Now Mumbai

trip to drop some guest for departure by the Bombay Mail which passed through that junction at around 8 a.m. from Calcutta<sup>1</sup> to Bombay<sup>2</sup>. Sometimes we would do this trip just as a picnic. The food attraction on such occasions was to have toast and omlette in the Non-vegetarian restaurant at the station. So we would leave at 6 a.m., reaching there by 7 a.m.; have breakfast and then be in time to ensure that our guest got into the Bombay Mail. We would enjoy looking at trains passing through the junction, such as Kalka Mail, Panjab Mail, or slower passenger trains or the occasional freight train. In an era when motor cars were rare, a trip like this was a treat for us.

I also have recollections of a disastrous trip we undertook to the Tandya Falls and to the temple of Vindhya-Vasini Devi. Vasantmama was with us on that occasion and as the trip was going to take altogether 100-plus miles, we were anxious to have a good taxi. A reliable one was found and as we settled the rates etc., the driver asked permission to get his nephew Banwari as a helper with us also, just in case. Since the car was a large American sedan, we agreed. In retrospect this turned out to be a wise decision.

As per plan, we set off early in the morning. The road was, however, largely a dirt track most of the way and half way through one of the wheels developed a puncture. It was replaced by the spare wheel, while we planned to get the puncture repaired at some roadside shop. At that stage, a thought crossed my mind: what would happen if another wheel develops a puncture? I asked Vasantmama who had just returned from Cambridge with a doctorate in statistics. He replied that the chances of two tyres developing puncture would be rather slim, so we hope that such a situation would not arise. Fortunately, this did not happen till we reached our destination. The faulty tyre was duly mended and we did part of our sight seeing and had a good picnic lunch (puri-Bhaji carried with us). However, shortly afterwards, a second tyre gave way and was replaced by the spare wheel that had been mended. The faulty one was again mended at a small garage. In all these operations, the driver was greatly helped by Banwari.

However, after an hour or so, we had another (a third) puncture and again the spare wheel was put in place. By now we were well on our way back and passing through very rural countryside with no help available if another tyre gave way. And, of course, it did happen, throwing overboard Vasantmama's laws of probability theory.

At this stage, the driver decided to use extreme measures. He and Banwari (whose presence we now saw was very useful) went around in search of grass and collected a heap of it which they stuffed into the faulty tyre! This gave a

'solid' appearance to it and he used it to drive the vehicle to a bus stop near a village. It was clearly not safe to drive the car much further as the driver feared that with frictional heat the grass might catch fire. As we stood there looking forlorn, in the middle of nowhere, a well-dressed villager came to us. He saw what had happened and said that the next bus to Banaras was not due for at least an hour; why don't we come to his house to take rest and have a cup of tea? After some hesitation, we took up his offer, with a doubtful Vasantmama estimating the relative likelihood that the man was a bandit out to take advantage of our plight. My father, who generally had a softer estimate of human nature, opted for trusting him and turned out to be right. The gentleman was very hospitable and his estimate of the bus arrival time was correct. So we mounted a rickety bus bound for Banaras and completed the remaining 30 miles or so, reaching the Malaviya Bridge on the Ganges around 11 p.m.

But that was not the end of our tribulations! For the bridge was closed for vehicles as it was being resurfaced. So our bus could go no further. We could, however, walk along the bridge foot path if we wished. There being no alternative, we dismounted, and with our belongings trudged along for a mile or so, reaching the Kashi station where we could get rikshaws to the B.H.U. campus. So we reached home well past midnight, exhausted but relieved that the ordeal was over!

Some of our longer picnic-trips involved rail travel. I think we did three such trips to Allahabad, situated about 200 km from Banaras. The distance was short enough, and the frequency of trains suitable for making a day trip to Allahabad. On one occasion we went by the metre-gauge (*chhoti line*), then called the Oudh-Tirhut Railway (O.T.R.). The O.T.R. was subject to several jokes for its very slow speeds, just like the M.S.M. (Madras and Southern Maratha) Railway down south. For example, the acronym itself was interpreted as 'Oundhi Terhi Railway' (prostrate and twisted railway). Nevertheless, the track passed through rural areas and the stations used to be small and with well maintained gardens, giving them an informal look. I do not know what the status of that route is today. It took around five hours to reach Allahabad this way. After a lunch at the Allahabad railway station and a couple of hours touring the city in a couple of rikshaws or a tonga, we could catch the train back to Banaras.

A faster trip was via the Moghalsarai station where we would catch the Bombay Mail in the morning, reach Allahabad in around four hours, again in time for lunch in the railway cafeteria and some sight-seeing. We could catch

the Kalka Mail back to Moghalsarai, reaching there around nine in the evening. A major attraction on this route was that these trains had the newly installed airconditioned class. The fare over this short route was not too exorbitant and we enjoyed the luxury for four hours. On one of these trips, Tai accidentally pulled the communication cord, while climbing to the upper berth. The train duly came to a halt. My father drew the attention of the railway attendant that the cord had been pulled in our compartment. He fetched the ticket checker who came and inspected the cord. Realizing that it was accidentally pulled, he wanted to be lenient and not impose the ₹ 50/- fine. To mitigate the circumstances further, he asked, indicating Anant who was then ten years old, whether he should record that the cord was pulled by the child. My father, always a stickler to the rules, declined and stated that the correct facts may be recorded. The T.C. was impressed by this display of honesty and left without collecting a fine.

Our brief sojourn in Allahabad included visit to the Ganges, or to the shopping centre, or to the local landmarks like the Mall Road, the High Court or the fort. Once we saw a movie in the Niranjan Theatre near the Railway Station. That was *Parineeta*, based on the novel of Sharat Chandra Chatterjee, with Ashok Kumar and Meena Kumari in the main roles. On one occasion, one Mr Johri, a former student of my father and working in the East Indian Railways, saw us at the Allahabad station and insisted that we came and had lunch at his house.

On the way back, we took the Kalka Mail and had dinner in the dining car. Both the lunch at the railway restaurant at Allahabad station and the dinner in the dining car of the train were of excellent standard. I similarly have recollection of the excellent lunch served in Diwadkar's restaurant at the Victoria Terminus in Bombay. Today, those standards of the 1940-50 have, alas, become part of history.

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The schools in the city closed down during the months of May and June, the hottest months of the year. Actually, after mid-March, the weather would begin to warm up and in April our school had to switch to morning hours, from 7 a.m. to 12 Noon or so. Of course with our acquired habit of getting up at five in the morning, the early hours did not pose any problem. After lunch and siesta, there was still time for studies, since it was injudicious if not impossible to emerge from the house before 5 p.m. for any play. As we played badminton

barefoot, we could not stand on the hot concrete to play in the afternoons or early evenings and so we were reduced to playing on Sunday mornings only.

The summer in Banaras being a very hot one, we had to make special preparations to face it. Those days we did not have a fridge in the house and Tai's various ingenious methods to keep things cool helped. Later we acquired an 'ice-box', which was nothing but a box for storing ice and foodstuff in contact with ice. We would purchase a five-kilo block of ice which was first available for five and a half annas. With inflation, its price rose to seven annas eventually. The block would last the day and would help keep water and other things cool.

To keep the house cool was another matter altogether. Till 1951, we had only one room in the house with a ceiling fan; later we had the luxury of two more rooms having it. But the main cooling effect was produced by the special *Khus*-curtains, which were periodically drenched with water. These curtains would be ordered new (or last year's were repaired) in early April and attached to the external doors and windows of the rooms one normally inhabited. A special person had to be employed to periodically throw water on them. Hot wind blowing through the curtains would cause evaporative cooling. The effect was in general very good and since we made the one room with ceiling fan the main room for occupancy, the ambience there was quite pleasant. We either slept at night in the same room with mattresses on the floor or had beds placed in the inner courtyard and slept under the starry sky—though occasional unseasonal rain would make us effect a hurried withdrawal indoors.

Getting up early morning and indulging in activities like going for a walk or some prayer function in the university or playing badminton were all welcome and we knew that after ten in the morning we would have to be inside, till five in the afternoon. Those were days before the television had appeared on the scene. We could venture out to see a movie in the only air-conditioned cinema hall in the town. Indoor games were the only means of time-pass between ten and five. During these vacations, we had ample time for play and Tatyasaheb, usually very busy with his research, teaching or administrative responsibilities, would also join in games like carom, bagatelle, cards, etc. He taught us the basic rules of bridge, and we had many games with the same pairings as in badminton with I partnering Tai and Anant partnering Tatyasaheb.

Mangoes were, of course, a special attraction of the summer season. The best one in the Banaras region was *Langda*, which also came in many varieties

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\*For those unfamiliar with the Indian currency in the pre-decimal currency era, 16 annas make a rupee.

and qualities. The best one was reputed to be that from the gardens of the Imperial Bank of India (which after the end of the British Raj, became the State Bank of India.). I always have a standing argument with my wife or with others from Maharashtra, concerning the ‘best Indian mango’! While they argue in favour of the *Alphonso*, I argue for the *Langda*, stating that they have not eaten the best quality Langda which would beat the Alphonso any day, only it is relatively rare to acquire.

Apart from mangoes, there were lychees. A former student of Tatyasaheb from Bihar would send a basket of lychees of the finest quality. We recall one summer when the basket arrived, we had placed it in the verandah and gone for a siesta. When we woke up and went to fetch the basket we found that it was empty! It turned out that Anant had not had siesta and eaten up all of the lychees. They were so delicious that he could not resist the temptation of eating them all one after another.

Making ice cream was another of the pastimes. This involved getting lots of ice and salt and stuffing it into the ice-cream maker which had saffron milk mixed with sugar to be frozen. We got several ‘editions’ of the ice cream and ate it to our fill. Sometimes we had friends sharing too. When a soda-fountain restaurant supplying a variety of ice creams opened near the Godaulia sector, we found it a great attraction especially during the summer months.

The long summer days were fun, no doubt, especially as they represented freedom from the daily school routine. Tatyasaheb was a voracious reader, but he also encouraged us to read, Hindi, Marathi as well as English. As mentioned before, Tai had already set the trend by reading us classics from all these languages and taking off from where she left off was almost natural. Going with father on book-shopping was an experience in itself. He had a couple of favourite bookshops in Lanka, just outside the main gate of the university. On reaching therewhile he buried himself into some new arrivals brought to his notice by the astute shopkeeper, we too would look for additions to our home library. And he would oblige us by buying some of our own selections along with his.

Rain showers in late June or early July would signal the end of summer as well as the end of the summer vacation. One ritual that my father enthusiastically supported was holding a pot under the first rain shower and collecting water to make tea! The tea made with the first rain of the season had a special flavour.

There were years when we avoided this intense heat altogether and visited Kolhapur. Those visits during the summer vacations added extra dimensions to our experience and are best described separately in the next chapter.

## SUMMER VACATIONS IN KOLHAPUR

THE summer months of May and June being very hot in Banaras, our school as well as the B.H.U. would be effectively closed during this period. It was possible, therefore, for all of us in the family to be on a long vacation outside Banaras. Although we could have visited hill stations or other sight-seeing spots in the country, my parents preferred to visit their home town, Kolhapur. Since 1932, my father had moved to Banaras and so he was anxious to keep his contacts in Kolhapur active. My mother had been in Banaras since 1937 and she too had strong attraction towards her family in Kolhapur. For us kids, the adoring aunts and uncles and a host of cousins to play with, made it fun to be in Kolhapur, especially away from the scorching heat of Banaras.

Originally these trips had been every year since 1938, but, gradually, they became once in two years and later once in four years. Nevertheless, whenever they took place they were something for us to look forward to. In this chapter I will live through my memory of those days.

Typically we would start in late April or early May and travel to Bombay by the Bombay Mail. We would break journey at Bombay, as my father had many friends there. Then we would proceed by train (the Deccan Queen or the Poona Mail) to Pune, where too there might be a halt. The last lap of the journey would be on the overnight Pune-Kolhapur Mail, reaching Kolhapur by mid-morning. While Tai, I and Anant would stay in the Huzurbazar-wada at the foot of Bhende Galli, Tatyasaheb would stay in the ancestral Narlikar

Bhavan on Mahadwar Road. Some eight weeks later, we would start our return journey to Banaras reversing the sequence of trains mentioned above. This would leave us a few days to recover from the journey, before the new session at school.

Since we were going to be away for two months, it was necessary to make some arrangement for locking up the house and ensuring that it was periodically inspected. On one occasion before my birth, there had been a major burglary while my father had gone to Kolhapur, and a lot of valuables were stolen. Since then, he had ensured that one of his research students would either stay on the premises or make periodic visits to ensure that every thing was OK. He would also ensure that important mail was forwarded.

The second major activity prior to departure was, of course, packing all the stuff that we needed for the trip. In these days of 'travel light', it is difficult to visualize the extent of our luggage. I recall counting all items on one such trip and reaching the number 17! Typically there would be four trunks, four suitcases, four hold-alls (these were foldable mattresses that also stored other items), two large earthenware water containers, and an assortment of smaller 'hand luggage'. We used to hire a station wagon with luggage career on top to carry all this luggage and us, to the Moghal Sarai station well in time for the Bombay Mail. Usually some student of my father would accompany us to the station to help out with the logistics. Of course, we would start by having a hearty breakfast (toast and omelette) in the non-vegetarian cafeteria.

There was of course no question of the passengers carrying their own luggage. One needed 4-5 porters or coolies, and to keep track of them rushing ahead with our bags on the crowded platform must have been an ordeal. I do not recall, however, there being any panic at any time. We mostly travelled by the second class, whose get up in the 1940s was better than today's first class carriages. Nor was it necessary to have prior reservation. When the train arrived, we simply looked for a reasonably empty carriage. Those days, there was no corridor connecting compartments; each compartment, with its attached toilet stood isolated on its own. It was generally possible to find one, or, at worst, we would have fellow-travellers bound for Allahabad.

As the journey would take us through the sweltering heat of U.P. and C.P. (Central Provinces, now Madhya Pradesh), we ordered a slab of ice to be placed in the compartment. This would be an enormous piece weighing twenty kilos or so. It would gradually melt, but in the process produce a cooling effect. The water so formed from melting would evaporate soon too. All the 17-odd pieces miraculously found place in the compartment, the hold-alls

duly opened out on the upper and lower berths, the trunks and suitcases shoved under the seat, and so on. It was desirable to have the toilet cleaned too, as we boarded. This service as well as carriage cleaning service would be readily available at a trivial cost. Tatyasaheb would then get down and look for some reading matter at the A.H. Wheeler book stall, or get into conversation with some friend or acquaintance whom he would chance upon to meet on the platform, while Anant and I would peep out of the window anxious if he would return before the train started. But, of course, for one who was so particular about time, the chance of that happening was negligible. He would be back well in time, much to our relief. Finally, when the train did move, we would experience the thrill of starting epic journey.

During the four hour run to Allahabad, we would start our picnic in the train. Usually we would eat puri-bhaji and some sweets, out of disposable earthenware plates and drink water out of similar beakers (called 'koolhars'). Allahabad had a special attraction for us because of the bridges over the Ganges and Yamuna that the train went on. Also, at Allahabad, the engine was detached and reattached to the opposite end. It took me some time to figure out why this reversal of direction did not bring us back the way we came!

Till Allahabad, the train belonged to the East Indian Railway (E.I.R.). Thereafter, it went into the territory of the Great Indian Peninsular Railway (G.I.P.R.). Some carriages were detached and some new ones attached here. The E.I.R. had green carriages, while any new carriages attached by the G.I.P.R. were maroon. Ours, of course, continued to be green, even though it went on the G.I.P. route.

By now it would be very hot. To avoid dust, we would have put up the glass shutters when leaving Moghalsarai. Now it would be necessary to put up the wood shutters too. Thanks to the ice block, the temperature in the compartment would be tolerable, although, the block would clearly not last very much longer. We would now stretch ourselves on the beddings in the hold-alls and catch a long siesta.

At Jabalpur station in the late afternoon we would have tea with some snacks. Soft soda drinks like orangeade, ginger beer, etc. were very much welcome, especially as they were from bottles stored in ice. Dinner would be available around 8-9 p.m., depending on how big the station was. Then we would stretch out again in our hold-alls.

The next morning would find us in Maharashtra. Those days the engines were mostly powered by steam and smoke would be plentiful. So it was wise to keep the windows shut. However, at Igatpuri, the electrical locomotives

would take over, and the route would also become more scenic. The ghat section with tunnels and bridges was a great source of thrill to us both. After having our breakfast delivered at Nasik, we would settle down for sightseeing. After Kalyan, we encountered the local train traffic into Bombay and while our parents were busy repacking our bags and hold-alls, Anant and I indulged in counting the local trains we passed either way. That trains could run apparently without engines was a surprise to us.

Coming into Bombay around noon, we had two alternatives before us. Sometimes we stayed in Hindu Colony, as guests of Shri Narayanrao Vyas (Vyas-Mama), in which case we would get down at Dadar. This involved getting all our seventeen-odd pieces down on the platform and negotiating with the ‘coolies’ about their delivery to Hindu Colony. As Vyas-Mama’s house was within easy walking distance, we arranged to have the luggage brought by a hand cart to the door while we walked by its side. My early recollections are of a remarkably quiet and traffic-free road, far from its present highly congested state. Also, even at noon, the warmth was nowhere as severe as in Banaras, and so walking outdoors was not a problem.

The other possible destination, in case we went all the way to the Victoria Terminus, was Sardar Griha, the hotel near Crawford Market, that was a favourite of the great Lokamanya Tilak. We would hire a Victoria (name given to a four-seater hansom cab) to go there while the luggage would come in a hand cart. It was not necessary to keep a continuous watch on the luggage, as the porters were reliable. The Sardar Griha those days was a favourite of middle class Marathi families as it was a clean place providing standard homely fare at modest rate.

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Bombay always impressed school boys like us as a modern city with its trams and buses as well as taxis and Victorias. We were dying to have rides on trams and buses, especially on the upper deck. I have pleasant recollection of going with Vasantmama to the zoo, when we took a tram all the way from Museum in South Bombay to the ‘Rani-cha baug’ near Byculla. We started early in the morning and returned by late lunch time after visiting the zoo. The sandy Chowpatty beach with green coconuts was another attraction for us especially since in Banaras there was no sea. If father felt more indulgent, he would also take us to a movie in the air-conditioned Metro cinema for some adventure film.

Malabar Hill and the Hanging Garden, Gateway of India, ride on a local train, Hornby Vellard, shops on Hornby Road, etc. were other attractions for us. My parents had many personal friends in Bombay and we would visit them too as our schedules permitted. On such visits, the hosts would typically serve the Hapoos or Alphonso mango which was in plentiful in May. Both Anant and I loved it, although when questioned by the typical Bombayite, we would staunchly defend the Langda.

On one such visit, Mr Nabar, a close friend of my father came round with his open car and took us for rides in and around Bombay. I recall driving miles along the shore up north and stopping by a quiet suburban station on the Bombay, Baroda and Central India (B.B.C.I.) Railway route. We sat on a bench and chatted for sometime in a quiet atmosphere, with hardly any crowd. This was in 1946. I am not able to identify the spot today, it having changed into a crowded, congested noisy and dusty location.

There are several such examples of Bombay having changed out of all recognition from what we vaguely recall in the mid-1940s to what it is today:

*...We walked from the Hindu Colony across the Tilak Bridge to the Plaza Cinema, hardly encountering any crowd at around five in the afternoon...*

*...I was admonished by my father for throwing a peanut shell out of the taxi window on Marine Drive, saying that one does not litter streets this way in Bombay...*

*...Walking down Marine Drive we encountered Mr Kakatkar, a family friend, driving along in the opposite direction. He saw us too and stopped right in the middle of the street and we had a quiet chat for some ten minutes...*

Such instances would be unimaginable in the hustle and bustle of today's Bombay.

Another attraction for my parents and later for me as I grew up to be a teenager, was the visit to a Marathi play in a theatre. In Banaras, my parents missed the plays for which Maharashtra is so well known. On reaching Bombay, they would look up the local newspaper and mark out the plays of likely interest to them. Marathi cinema came next on their order of priority and invariably we would see some in Bombay, Pune or in Kolhapur. We particularly enjoyed humourous movies such as those in which Damuanna Mavalankar (*Deva Pavala*) or P.L. Deshpande (*Gulacha Ganapati*) acted.

After 3-4 days in Bombay full of fun, we would take the Poona Mail or the Deccan Queen to Pune. I still recall the white carriages of the latter to single it out from the ‘ordinary’ trains. This journey lasting three to four hours was considerably shorter than the journey from Banaras to Bombay. We would either opt to wait for an hour or so before taking the train to Kolhapur or stay in Pune, again for 3-4 days, meeting relations and friends. More often than not, we opted to stop in Pune on our way back.

However, we would notice a change of tempo once we sat in the Kolhapur Mail. From the fast Deccan Queen or Poona Mail with its relatively sophisticated Bombay-Pune passengers, we were now in the quiet backwaters of the Madras and Southern Maratha Railway, which would take twelve hours (if not more) to do the 160-odd miles to Kolhapur. As if to mark the distinction, the metre gauge platforms were the last two in the Pune station, the more important ones being reserved for the Bombay trains. The engines would be steam-driven, rather than by electricity. Still my brother and I continued to share our thrill of train travel in this slow mode also. Usually, a number of friends and relations would come to see us off at Pune. I recall one family bringing a basket of figs which were not available to us in Banaras. We greatly enjoyed finishing the lot in no time.

The idea was that one slept through the journey and woke up to find the train on the outskirts of Kolhapur. In fact it managed to get late and usually reached there mid-morning. I recall on one trip, when the train reached Rukdee, a station very near Kolhapur, we thought that we were almost there, and in order to reduce our burden, we emptied the two earthenware containers of drinking water. However, we had acted too soon! For the train stopped at Rukdee, and would not move. We discovered that because of a derailment, the track was unusable till the derailed train was safely moved out of the way. After *full three hours*, we could finally start and at the standard speed completed the remaining ten miles or so in another half hour.

Several stories were prevalent about the slow speed of the MSM Railway. Here is one sample. One train enroute to Kolhapur stopped in its tracks. The guard asked the driver the reason, since there was no stop-signal. “There is a buffalo on the track”, said the driver. “I will move it out of the way and then we will start.” The train duly started after five minutes. It went on for ten minutes and stopped again. “What is the matter now?”, asked the guard. “A buffalo on the track again...I will soon move it”, replied the driver. The train started again and soon came to a halt. “A buffalo again?”, asked the guard. “You are right...there is a buffalo on the tracks. Wait till I remove it.” Replied

the driver as he was getting down. The guard asked: "This is very unusual! Is there a flock of buffalos grazing out here?" The driver replied: "No! There is no flock...a single buffalo keeps coming in our way again and again."

Much though we enjoyed our long train travel, we would all be delighted to see the platform of Kolhapur station. And more so, a host of our relatives both from father's and mother's side, as well as some close acquaintances would be there to welcome us. We would get into a series of tongas with our luggage coming in behind. My father would be taken to his house in Mahadwar Road while mother and the two of us would be taken to our maternal grandfather's house in the Huzurbazar-Wada. We would resume our associations with our uncles and cousins, and driven by Tai to have a bath and a meal in between, would engage them in planning the long vacation.

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The Huzurbazar-Wada was an old-fashioned house typical of Maharashtra and it had several hall-like rooms and small normal-size rooms. One enormous sized hall on the first floor was reserved for Tai and the two of us, for our bags and our beds (which were mattresses on the earthenware floor). On the first day, after our lunch, we would enjoy a long siesta and in the early afternoon descend to the kitchen for some goodies served by our great-aunt (called *Maoshi*) by all of us. She was in fact sister of my maternal grandmother who had died soon after childbirth when my youngest uncle Mukundmama had been born. Maoshi (who had been a child-widow) had then stepped in to help raise the young kids. Underneath her strict disciplinarian pose, we knew that she loved all us grandchildren.

I have good recollections of *Bhausaheb*, my maternal grandfather who lived till I was thirteen or so. He was a soft-spoken person whom all of us greatly respected. He would be engrossed in reading and chatting with some friends of his generation and did not much interfere in our childish pranks.

Our first act after refreshing ourselves with the afternoon tiffin was to walk over to Mahadwar Road and pay our respects to my father's relations there. His elder brother, Krishnaji Vasudeva Narlikar, whom everybody including ourselves referred to as *Kaka*, was some fifteen years senior to my father. He had not, however, received education to the high level that my father had. He spent his time mainly in household rituals and in looking after the land owned by the family. This land was given 'on rent' to a few farmers, who as per the practice current at the time, delivered a percentage of the produce

by way of rent. In the post-British era, this land was surrendered by the owners to the farmers working on it as per the act passed by the state abolishing ownership of land not tilled by the owner himself.

Kaka had a son and a daughter. The son, Ram was, I suspect, mentally retarded and did not progress beyond the school level. He died at a relatively young age in 1963. The daughter Sushila graduated and held jobs in Government offices. Their mother *Kaki*, as we called her, looked after the house and its guests and visitors.

Till recently since the house was pulled down and rebuilt, its internal and external appearance had virtually remained unchanged since time immemorial. So when my brother and I entered the first floor parlour, we saw Kaka and our father sitting side by side on a mattress laid on the ground with tall pillows (*Takkyas*) set up against the wall to lean on. We duly bowed and saluted all the elders as per the custom and were asked to sit down. Although we were entertained well in the house, we did not feel as at home there as at the Huzurbazar-Wada, largely because of the rather informal atmosphere prevailing in the latter place with a predominance of the younger age group. By contrast, at the Mahadwar house, we met mostly very senior people whom one would speak to only when spoken to.

When we were small, we enjoyed playing hide and seek with our cousins and uncles. The youngest of the latter, Mukundmama being only three years older, joined us sometimes. But the Moghe brothers (Vinay and Vijay), the sons of Akkamaoshi, were more or less our age and invariably joined in the fun. Their next elder brother Kumar was closer to Mukundmama in age and interests and was peripheral to our group, except when he regaled us with imitations of humans and animals, an art, he is good at even today. Morumama and Mukundmama introduced me to chess, while Nanamama and his friend, one Mr Sanghas, took us on bicycle rides around Kolhapur. Dadamama was good at handiwork, and it was interesting to watch him at his creative activities.

Despite its roominess and other comforts, like most of the city toilets, the Huzuebazar-Wada did not have flushing (even water-rinsed) toilets. Those in operation were located out in the garden and one had to walk some twenty metres to reach them. The night-soil deposited at the lower level was collected and disposed of by professionals. It was in the 1960s that the municipal corporation provided inducements for the homeowners to convert these primitive toilets into modern ones.

We also went on long walks, often in the direction of the railway station as trains fascinated us all. Sometimes we would see trains arriving and departing,

or an engine being shunted or turned around. There were also special saloons belonging to the royal family of Kolhapur, standing on the tracks. We would try to climb them to catch glimpses of the luxurious fittings inside. How we wished we could travel in this luxury! The other extreme of our ambitions was, of course, a ride in the railway engine. I got this wish fulfilled much later, in 1986, when by courtesy of a railway official I travelled on the engine of Koyna Express on the Pune-Lonavala sector.

Sometimes our walks would take us farther out to the top of Temblai Hill, named after the goddess of the same name. From the top of the hill we could get a good view of the city as well as of the rail-track that wound past it. I remember, once on the way back from this long trip, we stopped at a local restaurant that specialized in *Amboli* (a special version of dosai), a treat we enjoyed immensely. Other walks would take us to Khas Baug, where in the *Sath-mari* in the old days elephant-fights were staged for royal spectators. There were shelters built in stone and concrete where the Indian equivalent of the Spanish Matador would take shelter if the elephant became very belligerent and threatening. Then there was the local lake called *Rankala*, which has now been done up as a tourist attraction. Near Rankala there was the *Shalini Palace*, which was one of the royal palaces. It sometimes used to house V.I.P. guests. There was also *Juna Rajwada* (the Old Palace) which was then used to house the Rajaram College, and the *Nava Rajwada* (the New Palace), which was way out of the city where the royal family actually resided.

The Old Palace had two elephants on view and in my young age they were a source of great attraction to me. They were within easy walking distance from the Huzurbazar-Wada and my mother would often bring me to see the elephants. I am told of another story of my being taken to see the New palace once. I was then wearing a jacket made to look like tiger skin. As we stood outside the palace, the princess (then a little girl) came out with an attendant. She was fascinated by my jacket, presumably she later insisted on having a similar one!

Another favourite pastime was watching movies. One year our favourite was V. Shantaram's "Doctor Kotnis ki Amar Kahani" which we saw at least four times. Another year it was Bob Hope's "The Princess and the Pirate" which also drew several encores from us. One Marathi film led to an interesting aftermath. It had a song with the main line "Japun chala bai japun chala" (Careful, Lady! Walk with care). My cousins Vijay and Vinay changed it to "Shakuntala bai japun chala" (Shakuntala bai, walk with care!), which they kept on singing whenever their elder sister Shakuntala happened to be in the

vicinity. This annoyed her greatly and therefore added to the mirth of us kids. Later, I too started singing the modified refrain and it became a habit with me. As on that trip we were stopping in Pune and staying with the distinguished Wrangler Paranjpye and his daughter Shakuntala Paranjpye, my parents warned me on no account to sing this line there. I obeyed as much as possible; but on one occasion I slipped in my abundant caution and let out the line in full gusto in the Paranjpye house. My father immediately rushed in with finger on his lips to silence me. I realized my slip and stopped at once. Fortunately none of the Paranjpyes were at home and no embarrassment was caused.

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However, it was not all play and no work in Kolhapur. My parents saw to it that we were also constructively occupied for some of the time. Thus one year we went to typing classes and learnt a bit of key-board typing. Our speed was not anything to be proud of; but we picked up the knack of typing without looking at the keyboard.

Another 'skill' we were trained for was swimming. At the crack of dawn, we would be woken up by Nanamama and taken to the Panchaganga river ghat for swimming lessons. A friend of his, Mr Ram Aundhkar, a maths graduate and a goldsmith by profession, joined us and the two would coach us in swimming. The progress we achieved was measured in annas out of a rupee. Thus progress to four annas meant that we had reached up to 4 out of 16.

Somehow, neither of us really took to swimming. The fear of water continued to trouble us, even though we reached up to 14 anna level. At that stage, both of us had cold and fever. Tai then put a stop to our lessons, much to our relief. We hoped that by the time the fever passed, it will be time to return to Banaras. We were to be disappointed! Our fever passed in four days and the doctor permitted resumption of swimming lessons. Tai accordingly instructed Nanamama to resume the lessons. As luck would have it, in the week or so remaining we did pick up swimming and on the penultimate day, both Nanamama and Ram Aundhkar declared that we had reached the 16 anna level.

This meant that I could swim over a distance of some ten yards! Back in Banaras, neither of us had occasion for practice, and it was not until 1979 that I got the chance to see how much of it I had retained. With some practice it all came back!

Rains arrive early in Maharashtra, compared to the North. So by

mid-June there would be the onset of Monsoon and a signal for us to wind up our stay. My father had a good story about his acquaintances in Kolhapur. When he first encountered them after arrival for a two-month stay, they would greet him with: "Nice to have you! When did you arrive?" Half way through the stay, if they met him, they would say "Are you enjoying your stay?" And towards the end, if they ran into him, they would exclaim: "Oh you are still here?"

There were a host of friends and acquaintances that we called upon when we came to Kolhapur. Although my parents had long associations with them, nearly all of them were remote from us two brothers. So most of the conversation would be lost on us. Our sole participation in the social intercourse was to recite some shlokas when called upon to do so. Some of the seniors whom we met on a previous trip may not be around on the next one. The passage of time gradually wipes out older associations and initiates new ones. My parents, who had been away from Kolhapur since the 1930s, gradually lost the personal contacts which had their origins in their younger days. Time and again, I have noticed this phenomenon in my case too. Whether it is Kolhapur, Banaras, or Cambridge, the place may be the same as before, but one's perception of it changes with time.

There would be at least one grand feast in the Huzurbazar Wada during our visit, when close friends and relations would be invited for lunch. The setting on such occasions was traditional. Tables and chairs for dining had still not come into middle class life, and people would sit in well-defined rectangular pattern, on '*paat*', a pedestal-like platform to squat on. The food would be served on a *thali* in front, with '*Rangoli*' (decoration, often with flowers adorning it) around it. Men would sit first. There may be seating for, say, twenty persons. But if there were more, additional seatings (*pangat*) would follow. Ladies of the house would serve the food, often assisted by even the lady guests if they were close to the family. Ladies would eat in the end. Here too there would be occasions when people would sing or recite on general demand. Anant and I had to perform on such occasions too.

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The return journey towards the end of June would bring about a general feeling of sadness for parting after a very enjoyable visit. For us brothers there was the added feeling that the vacation was drawing to a close and that the day of going back to school was not far away. As at the time of arrival, a host of

relatives and friends would crowd the platform to see us off. Quite a few would sit in the carriage and chat till the time of train-departure drew near.

I am told an interesting story about a similar occasion when I was may be a year or so old. As a child, I was being held by some relation while my parents were busy chatting. The train started, but they were assured that this was not the final departure but a part of shunting operations. So nobody bothered to move. However, shortly it became clear as the train gathered speed that this was proper departure and that I had been left on the platform! Fortunately, with the MSM, speeds were never very high and the train was halted by pulling the communication cord, before it had gone out of the platform.

The train left in the night, arriving in Pune the next morning. Again, we would either halt there for a few days (as we did for example, when we stayed with the Paranjpye family), or we would take the Bombay train (Deccan Queen or the Poona Mail) that left a short duration after the arrival of the Kolhapur train.

In Bombay we would stay at Sardar Griha or in Dadar in the Vyas-bhuvan. By now the monsoon would be in full swing and we had a taste of the Bombay rains. The return to Banaras through Moghalsarai would be by the Calcutta Mail via Allahabad, departing the Victoria Terminus late in the evening. We had a peculiar thrill being safe inside while it was pouring cats and dogs outside. The next day would, however, bring us back to the last vestiges of high summer, for the rains would not have penetrated as far north. We would get down at Moghalsarai well past midnight and take a connecting train to Banaras Cantonment Station, or hire a station wagon from the station. A familiar scene that greeted us as we entered Banaras, at two or three in the morning, would be cows sleeping on the main streets. Sometimes they would have to be woken up and moved before the vehicle could make its way.

Back in our house, it was a strange feeling entering a place that had not been lived in for two months. Tai would have to employ special efforts to get all dust swept off, restock the kitchen, and recall the washerman. Tatyasaheb would pick up the threads of his university work. While Anant and I would start the operation 'Back to School'.

## COLLEGE DAYS

ALTHOUGH as children we were untouched by any university politics, both my brother and I were aware that with the departure of Dr S. Radhakrishnan, my father had been very unhappy at the turn of events and the changes they were bringing in the university. Before independence, the B.H.U. had the reputation of a university founded and run on nationalist and a highly principled attitude, paying the price, if necessary, in the form of financial stringency. In the newly independent India, the B.H.U. was elevated to be one of the few 'central' universities, liberally financed by the Government of India. The new University Act to replace the old one, brought in (under the name of democracy) changes that meant more bureaucracy and external interference. I will express myself in detail on this and related issues elsewhere in this book.

During the years that followed, therefore, my father became more detached from the affairs of the university, feeling sad that the old values were no longer respected. A trend that set in, for example, was the dominance of parochial attitudes in the university governance. The B.H.U. till then had enjoyed a truly national, all-India character with its merit-laden faculty drawn from all over the country, in turn attracting the cream of student talent from all over India. Paradoxically, however, having been declared a 'central' university, with the very same ideals, the organizational attitudes changed to support the 'sons of the soil' syndrome. The student-power and energy that had been till then channelized into anti-British movements now found the local authority as a

suitable target. There began the student disturbances against the university authorities, initially subdued and rare but becoming more frequent and violent till ultimately the Vice-Chancellor had to leave. Had the power and energy been channeled in positive and creative modes, the situation might well have been different. But there was no political will to achieve such a result.

Into this cauldron stepped in the veteran socialist intellectual Acharya Narendra Deva who had played a major role in the anti-British movement, but had genuine disagreements with the Congress party led by Jawaharlal Nehru, and preferred to do social work as a member of the socialist party. Nevertheless, as a scholar and leader of people, he commanded great respect in the ruling circles in Delhi and was therefore appointed Vice-Chancellor of the prestigious B.H.U. The new university act empowered the V.C. to select his own Pro-Vice-Chancellor (P.V.C.). So, when he came to Banaras, there were a number of aspirants for the post of P.V.C. However, he sprang a surprise. He selected an academic who had shown no interest in that position: my father. He became the next P.V.C., largely because of his reputation as a scholar as well as an administrator.

So it was that when he accepted this important position, my father came home and announced that this change of position required him to move to the official residence of the Pro-Vice-Chancellor. He also mentioned that his office also entitled him to the use of a staff car. While this latter news was greatly welcomed by my brother and I, we were both dismayed at the prospect of having to quit our house. Especially my brother was inconsolable. We realized how attached he was to our house, when he said that we may leave if we so wished, but he would stay put! Nevertheless, we were somewhat reconciled by the assurance that after the term of P.V.C. was over, we would return to this very house.

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We accordingly moved to the Holkar House, the official residence of the Pro-Vice-Chancellor, which faced the Cochin Guest House which was the official residence of the Vice-Chancellor. It was more spacious than our earlier house, and my father had a clay badminton court erected for our use. The official car was entirely at his disposal and we could use it for making trips to the town or in the surrounding countryside. We also had the help of peons and a driver, although the former hardly worked at all, being mostly in a state of stupor at their posts.

I have happy recollections of Holkar House, for it was here that I learnt that I had topped the list of the matriculation examination conducted by the university. It was here that many of our relatives came from Maharashtra to stay and do a 'Kashi-yatra'. The luxury of a car meant many enjoyable picnics.

After my matriculation examination, I enrolled in the Central Hindu College, Kamachha, a college in town that had predated the university, and was now used for the intermediate classes of the university. It had spacious surroundings and large class rooms. From a relatively small school, this was a much bigger establishment with students coming from outside Banaras too. By tradition, the second year brought new students from Delhi schools. As most of these had spent an extra year in school, they were given the benefit of one year here. Most of the students who came to B.H.U. were largely lured by its famous Engineering College. Thus these were generally a bright set of students and the average competence of students in our class went up with their arrival. So, although I had continued to stand first in the first year exams, I realized stiffer competition lay ahead in the second year.

As the college was in the town, I, and a year later my brother, both used to cycle to it from the university campus. The distance was some four miles and it took us around twenty five minutes in the prevailing traffic conditions. The traffic was mainly of cycle rickshaws and occasional tongas; with a few motor vehicles thrown in. Today the traffic is far more chaotic, being dominated by the polluting scooters, noisy auto-rickshaws and recklessly driven cars. I would hesitate to cycle to Kamachha today.

I recall many teachers of those days. Mr Bose, who had a limp, was an extremely dedicated teacher and taught physics to the second year students with great personal involvement. I had some contact with Mr C. Purushottaman, physics teacher of first year, even after he retired to Kerala. Amongst the chemistry teachers I recall Mr Mathur, who had joined as a new teacher in our first year. The students normally give short shrift to new teachers and Mr Mathur encountered a lot of problems to begin with. However, gradually students began to appreciate his merits as a teacher and he became quite popular.

We still had a paper in Hindi. Mr Bachchan Singh who taught us that subject, revealed to me that he had been one of the examiners who had given me distinction in Hindi in the Admission Examination. There was a compulsory Hindi paper at the Intermediate Examination, and as it transpired, I was able to get a distinction in this paper too.

There was a paper on 'religion' also, perhaps an indication that I was

studying at the ‘Hindu’ university. This class left me cold, however, as the teacher simply rambled on relatively unimportant issues. I believe, one can make a course on religion quite interesting, if one emphasizes on the philosophical rather than the mythological or ritualistic aspects of the same.

Perhaps I should comment here that my medium of instruction had changed from Hindi at school to English at C.H.C., a circumstance that did not pose any significant problem to me. Indeed the arrangement worked out fine. From my experience, I feel that elementary education (including maths and science) should be in the local language which the student otherwise imbibes. The switchover to English, especially for the maths and sciences can be more advantageous in higher education in these subjects. For, at higher level one has to acknowledge and appreciate the global role of English, especially for science and mathematics and the richness of its literature on these subjects.

No description of my C.H.C. days would be complete without a mention of Professor Mazumdar, who was in charge of Physics and supervised the practical classes. He had a huge frame with a strong personality to go with it, backed by a powerful voice. His roars could be heard across the long corridor, and unless a nervous student were careful, there was every chance of him dropping whatever apparatus he was holding if the roar were directed at him. Gradually, Prof. Mazumdar came to recognize who the scholars were and was more soft-spoken towards them, which included me. However, at the Final practical examination he put me in an awkward spot! When the External Examiner (a bearded but benign looking professor from Aligarh) came to interview me, Prof. M. introduced me as the ‘Best student in the College’ and asked the examiner to pose difficult questions to me.

Anyway, I managed to survive the ordeal, and when the results were declared, I at least justified Prof. M.’s confidence and stood first in the I.Sc. Examination, this time getting distinctions in all science subjects, as well as in Hindi.

My two years at the C.H.C. saw us return to our old house after my father completed his tenure as P.V.C. Although his appointment was over when Acharya Narendra Deva left for health reasons, his successor Sir C.P. Ramaswamy Ayyer requested him to continue in that capacity, which he did for about a year. Thereafter he preferred to return to being a Professor of Mathematics. The university had meantime given our staff quarter on short term rental to some faculty members, and it was made available to my father when he desired to make this change.

During these years I appeared in the university’s Geeta Examination at

the elementary level. I did get an award, although it was not the first rank award but award for standing third. It did not quite satisfy me and so I decided to appear and do better in the higher level examination the next year. There was another incentive for doing so, for the following reason. During the award distribution ceremony, a photographer was taking the pictures as each awardee rose to receive the award from the Vice-Chancellor Acharya Narendra Deva. When my turn came, however, the flash did not work and the photograph was spoilt. I was very disappointed at not having a photographic record of my award at the hands of a distinguished person. My father, however, consoled me by saying that if I did well enough to receive an award next year there would be another occasion for the photograph. The next year, I appeared in the advanced examination and did get the first award. The prize distribution occasion was repeated with the same photographer and guess what? When my turn for receiving the award came, the flash failed again!

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After the intermediate examination, my natural route was to the B.H.U. Science College, since I had all along wanted to go for a career in science and mathematics. As mentioned before, the College of Engineering offered the alternative which attracted many bright students. Having topped the list for the I.Sc. Examination, getting admission to the highly competitive Engineering College posed no problem for me, and many faculty members in that college expected me to join it. However, I opted for science. Today, students in the merit list of the Higher Secondary Examination rarely opt for science, the default options being medicine or engineering.

I opted for the maths-physics-statistics option. The physics classes were held in the Science College, Physics building, whereas the mathematics and statistics classes were held in the neighbouring Arts College building, where the mathematics department was housed.

Amongst my teachers I recall specially Professor Kamala Prasad Singh who lectured on dynamics in a very methodical manner, with an aura of precision so very essential to maths. A contrast was the ebullient Professor Babu Lal Tripathy, who preferred to teach the Hindi-medium classes but also lectured to us (in English medium) on occasions. He had an informal style which often resembled that of a preacher. Later I came across the phrase ‘Missionary talking to cannibals’, used by the Cambridge mathematician Littlewood while commenting on the informal style of his colleague

G.H. Hardy in his classic book on mathematical analysis. He had a counterpart in Physics Department, Professor Ghosh, who was also a beloved teacher of successive generations of students.

Once an amusing thing happened in K.P. Singh's class. To do some calculation he required the tables of logarithms. So he called the peon Jagan and asked him to bring the "log table" from the teachers' common room. After some time Jagan reappeared perspiring and lugging the heavy table from the common room!

For our statistics classes, we had practicals which required computation. We were provided with *Facit* hand-calculators, which operated by turning a crank and performed the basic operations of addition, subtraction, multiplication, division and square roots. Later we also received electrical machines, which did the same jobs by pressing buttons. What marvels of convenience these machines seemed at the time!

For our statistics course, there was also a practical examination and an oral one to go with it. The distinguished statistician, Professor C.R. Rao had come as the External Examiner. Years later, we happened to meet at a wedding in Pittsburgh when Professor Rao reminded me of that 1957 encounter!

When the results of the B.Sc. examinations were announced, I was at the top of the list with record marks, a feat that was a repeat of my performance at the I.Sc. Examination. We were traveling in Maharashtra during our summer vacation trip, when his assistant communicated the result by telegram to my father. I was particularly happy at this performance, as it was to be my last one in India. For, I was hoping to go to Cambridge in England for higher studies.

When we returned to Banaras, I recall a conversation I overheard between my parents who thought that I had fallen asleep. My mother expressed her disappointment that as we were out of Banaras, she missed seeing any special announcement of my name in the local newspaper. [The newspaper usually printed a special item with photograph whenever some student in the city performed an academic or a sporting feat.] My father replied: "Well, you need not worry! I am confident, there will be several occasions in Jayant's life later when we will see his name in the newspaper." I do not know if this reply satisfied my mother, but it immensely boosted my self-confidence; for Tatyasaheb was usually very economical in bestowing accolades.

But I also knew that Banaras was a softer testing ground: the real test lay ahead in Cambridge.

## PREPARATION FOR CAMBRIDGE

**I**N the colonial era, when my father had topped the B.Sc. list in Bombay University, the main career options before an Indian for higher education were, firstly, the Indian Civil Service, which offered to the successful candidates plum posts in the country's administration and secondly posts in education and research in the Indian universities and colleges. To those ambitious enough to widen their educational horizons, there were the academic centers of excellence in the U.K. and Europe. The lure of the United States had not yet begun to surface. In my time, that is, in the mid-1950s, that option had begun to gather more momentum as the chance of getting a fully paid scholarship in a U.S. university was perceived to be higher than that in a European one. However, the U.K. and Oxbridge (word combining Oxford and Cambridge) in particular, were still considered the Mecca for the young hopefuls.

In my case, the choice of Cambridge had been more or less automatic. I was interested in having a good graduate degree in mathematics and the Cambridge Mathematical Tripos was considered (and is still regarded so!) the most difficult examination to pass. In my father's time, the overall course led to the Part II, *schedule A* as the first step, followed by the Part II, *Schedule B* in the following year. Those not interested in doing research stopped at the first step. Passing this examination entitled them to a Cambridge Bachelor of Arts (B.A.) degree, while those who passed in first class were called *Wranglers*. Likewise, those who cleared the Schedule B with distinction earned the qualification of *B Star*. My father had done the Tripos on a fast track, taking

two years instead of three, and had distinguished himself as a *B Star Wrangler*.

Thus my first (and almost the only) choice was Cambridge. ‘Almost’, because, as a stand-by I had also applied to Harvard and Oxford, the latter for a Rhodes scholarship. I was prepared to withdraw both applications as soon as I received confirmation from Cambridge.

At this stage what did my vision for the future include? My hope was to negotiate the Tripos successfully, do a Ph.D. and return to India for a university post in mathematics. My father had also gone to Cambridge with a similar intention. In his case, however, his professors like Eddington and Smart, while encouraging research, had discouraged doing so with the aim of a Ph.D. In those times, distinction in research was measured by the quality of one’s research publications and not by the label of a Ph.D.! In the post-war England, conditions had changed and the doctorate degree had acquired respectability, and, in some cases, it had become a necessity.

Today, a young student going abroad usually has a different set of priorities.

\* \* \*

While in my first year of B.Sc., my father wrote out an elaborate application for my admission to Cambridge. It was customary those days for applications to Oxbridge colleges to be routed through the Education Department of the Indian High Commission in London. Smt Vijayalakshmi Pandit was the High Commissioner of India and the letter forwarding my application was addressed to her. Of course, it would be routed to the Officer-In-Charge Education Department, in this case one Mr S.G. Sathaye. In this letter my father had expressed preference for admission to a college like Trinity or St John’s, which had many mathematical luminaries as fellows. However, he had also expressed the fact that if I got admission to his own institution, Fitzwilliam House, he would be quite happy.

Perhaps some explanation is needed here for those unfamiliar with the Oxbridge system of colleges and departments. The University of Cambridge has several constituent colleges (then around 20, now around 35). Each college, is, however, fully autonomous and has its own administration and staff designated as fellows. Normally each college caters to all subjects taught by the university; however, *the formal teaching of those subjects is the responsibility of the university, discharged through its departments*. A typical college would only look after the accommodation of its students and their tutorial requirements. Normally, a college fellow would also be on the staff of the university, although

there may be fellows who are not so connected, as well as some university faculty members who have no college connection. Similarly, a student would live in a college but go for lectures in his/her subject to the appropriate university department.

A college is not, however, just a student hostel. It is a community in itself where the seniors (fellows) and juniors (students) meet and dine together, have social intercourse, with, of course, tutorial supervision provided to each and every student. In contrast, Fitzwilliam House had been set up by the University as a *Non-Collegiate Student Institution*, wherein all other roles of a College, except accommodation on the campus, were discharged. Whereas, in a typical college, half the student population would live on the campus, and the other half live in lodgings (called *diggings* or *digs*), in Fitzwilliam all students had to live out in digs. Thus the corporate nature of living was not possible, except for lunches and dinners taken in the dining hall.

This arrangement had been introduced to cater to students who did not have adequate financial resources to live in a college where fees were higher. This income-anomaly had, however, more or less disappeared in U.K.'s post-war welfare state and so there was a growing sentiment that even Fitzwilliam House should now become a full-fledged college. This it did become around 1962-63; however, in 1957, it was still a non-collegeate institution. Naturally therefore, despite his loyalty to his own institution, my father was anxious that I should get the benefit of living in college. Apart from writing the letter to India House, he also wrote separate letters to St John's and Trinity Colleges and to Fitzwilliam House, mentioning in the last one that he himself was an alumnus of that institution.

At first, he received negative replies from all three, thus casting a damper on my hope of going to Cambridge in October, 1957. However, a few weeks later, a positive reply came from Mr R.N. Walters, Senior Tutor of Fitzwilliam House confirming my admission. Apparently, the original application routed via India House had been received, duly evaluated and approved for admission by Fitzwilliam. On the other hand, my father's letter sent direct to Fitzwilliam later, had not come through the proper (India House) channel and so had evoked a negative response! Whatever the modality, the way was now opened for my entry to Cambridge.

\* \* \*

The cost of a Cambridge education in 1957 was around £ 600-650 per year.

With the pound pegged at ₹ 13.33, this worked out to around ₹ 8000-9000. My father's professorial salary being ₹ 1250 per month, my expenses would have eaten up a substantial fraction of his salary. My father was therefore anxious to secure some grant or scholarship for my studies. [Today's arithmetic is far harsher in this respect! The annual cost of a Cambridge education is around £ 25,000, and with the pound floating around ₹ 100, the professorial salary in India of, say, ₹ 75,000 per month is less than half of the Cambridge expenses.]

His enquiries revealed, however, that whereas there were scholarships, fellowships and grants available from the Government of India, they were for post-M.Sc. studies, and for teachers in universities going for Ph.D. degrees. They did not cover a B.Sc. student going for the Tripos course. He was, however, aware that there existed the J.N. Tata Endowment for Higher Education of Indians, set up by the Industrial House of the Tatas. For, he himself had been a recipient of a Tata Scholarship when he went to Cambridge in 1928. Accordingly, he wrote to the J.N. Tata Endowment enquiring about possibilities of a scholarship. He also arranged for a testimonial to be sent by no less a person than Dr S. Radhakrishnan, who was then the Vice-President of India. Mrs Piroja Vesugar, the Director of the Endowment wrote back saying that although the last date for applications was past, she would like to interview the candidate in order to decide on the issue.

That was in the summer of 1957. We were to go on our usual trip of Kolhapur that summer and so it worked out fine. An appointment was made for me to be interviewed at the Bombay House, the headquarters of the House of Tatas on Home Street in Fort in late June. As we came down from Pune by the Deccan Queen, we took a retiring room at the VT station. We had a good lunch at the station canteen run by Diwadkars —a sumptuous thali at a cost less than a rupee! There we ran into Dr G.S. Mahajani who, on learning that in the afternoon I had an appointment to see Mrs Vesugar, offered to tag along and present his greetings to her.

I still have a graphic recollection of that interview. At the outset, this formidable lady bowled a googlee, with her remark: "So you have brought a procession to meet me." She did not want my father and Dr Mahajani to be present at the interview, and this was her direct way of stating so. Taking the hint, they withdrew after conveying their greetings to her.

Mrs Vesugar maintained her formal and rather aggressive stance throughout the interview. She, of course, had access to my academic record and knew of my successes. She was also well informed that both my father and uncle, Vasantmama (V.S. Huzurbazar) had been successful Tata Scholars. But

she began by telling me not to be complacent while launching my expedition to Cambridge. She told me names of sons of distinguished Tata Scholars who had done badly at Cambridge. She asked me about my interests, the books I had read, my hobbies, etc. and at the end of an hour or so let me out somewhat dazed. She then had a brief talk with my father and Dr Mahajani, and in the course of it conveyed her ‘cautiously favourable’ impression of me. She did not promise anything, but stated that the Trustees would convey their decision very shortly, since I had to leave for England in September.

We returned to Banaras with a cautious optimism. Sure enough in July, I received a letter from Mrs V with the good news that the Endowment was willing to make available an amount of ₹ 19,000/- of which ₹ 8,000/- was an outright grant while ₹ 11,000/- would be a long term loan at a modest interest of 2%. I was to insure myself for the loan amount with the Life Insurance Corporation of India. Since the total cost for three years was estimated to be ₹ 24,000/-, this left only ₹ 5,000/- to be contributed by my father. He felt that he could manage that within his professorial salary.

\* \* \*

Mrs Vesugar had asked me to see her again before I returned to Bombay in order to take the steamer for London, as she wished to give me tips on how to conduct myself in the U.K. (the so-called British manners!) and also to select my wardrobe! She booked me on the S.S. Strathnaver of the P.& O. Company departing Bombay on September 5, and reaching Tilbury Docks near London 18 days later. My father suggested that I visit Bombay and spend a few days there prior to departure. Accordingly, I went ahead and my parents would follow in time to see me off.

Mrs Vesugar got the head tailor from Dean & Sons in Colaba and asked him to stitch some warm clothes *suitable for England*. This last qualification was important, as she felt that the style had to be right and she did not trust a tailor in a small town, as she thought of Banaras. Accordingly, I recall getting two suits and a tweed jacket stitched by Dean’s establishment. And, during these days, I inadvertently committed what in Mrs V’s eyes was an unforgivable sin!

The episode relates to my first visit to her, during which she had mentioned that the dress code required that whenever I wore a full-sleeve shirt, I must put on a tie, whereas, with a half sleeve shirt, I should not wear one. Now, I had not yet got into the tie-wearing habit and therefore, it so happened that in one

of my meetings with her, I showed up in a full sleeve shirt but without a tie. I had come, I think with the tailor from Dean & Sons to check the fitting. She immediately noticed my lapse and boiled over. She not only asked me to leave immediately and return with a tie on, but asked the tailor to go with me to his shop and give me a new tie. [She probably did not trust my judgment regarding a tie!] And so, in about twenty minutes, I showed up with a decent tie. By then she had cooled down, but still felt it necessary to give me a brief lecture on the dress code. She also instructed me on the cutlery code, on the sequence of knives and forks to be used in a multi-course dinner.

It was during one of those visits that my uncle Vasantmama accompanied me, after a prior appointment, of course. He had been a Tata Scholar during 1946-49 and had acquitted himself well and so had been in Mrs V's good books. I recall that he had brought with him a small gift for her too, which gesture pleased her a lot. Although in her reckoning, a good father and a good uncle were a positive assets for a new Tata Scholar, she was worried because she knew several scholars with these assets who failed to do well in Oxbridge. And so, she frequently enjoined me not to be complacent.

On one account she was particularly keen: the Reserve Bank of India used to allow the limited amount of foreign exchange of £ 600 only per year to Oxbridge scholars (less for other British universities), and it was important that I stayed within this limit. For, if one exceeded this limit, there was no way one could legally meet one's commitments abroad. As it happened in my first year, I had spent only £ 480 or so and this impressed her as much as my performance in the Tripos. She kept telling other Tata Scholars to be as frugal as I was. Most of them found this a difficult example to emulate and expressed their displeasure with me for setting such a stringent limit for them!

\* \* \*

In earlier chapters I have narrated my encounters with Morumama and the important role he played in my formative years at school. Although Vasantmama had also stayed with us for two years for his M.Sc. degree, I was too small to derive any benefit from his presence. But now he stepped into my life in a big way. Living in Pune, where he was the Professor and Head of the Department of Mathematics and Statistics, he could frequently visit Bombay and also invited me to stay with him during my longish sojourn in Bombay.

It was from Vasantmama that I learnt all those practical details of living in Cambridge that I was to find so helpful later on. He had been in Fitzwilliam

House too and so knew a few people on the staff there as well as some Cambridge dons who had probably now retired but were still around. He wrote letters introducing me to them and asked me to call on them with small gifts which he had so thoughtfully acquired.

He also told me what meals would be like and how much they would cost. As he was there during the height of post-war austerity (such as rationing limiting one to a single egg per person per week), eatables had been in short supply. However, by the time I went, rationing had ended and so he expected things to have improved. Also he told me which restaurants would give decent food at reasonable prices (e.g. Lyons), and how much I should expect to spend on food and lodgings. Eventually, when I started my Cambridge life, I found these figures basically correct subject to a modest inflation. So far as travel was concerned, he advised me to attend vacation courses conducted by the British Council, which provided inexpensive ways of seeing Britain and learning more about it.

Till now, I was a vegetarian of the egg-variety and had decided to expand my range of food to the ‘non-vegetarian’ domain on the boat, which would offer ample opportunity of sampling western food. I did not have any preconceived ideas, either positive or negative about non-vegetarian food, although I had decided to stay away from alcoholic drinks. Still, to ‘educate’ me in a non-vegetarian breakfast, Vasantmama specially bought bacon from the grocery section of the Dorabjee shop in Pune and cooked it with fried eggs for me! I may also add that as a P.G. Wodehouse fan my theoretical knowledge of Western food was based on the descriptions in his stories and novels.

It was with Vasantmama’s help that I bought various items that I might need in Cambridge including bags for carrying them. I found that even though boat-travel allowed a generous weight allowance, ultimately it would help me to travel light. In a land that relied on self help, Vasantmama cautioned me, that it would be hard for me to secure help to carry all my luggage. So I managed to trim my requirements to four suitcases of various sizes, avoiding the need for a large ‘cabin trunk’. It would be impossible for me to recall each and every practical instruction that Vasantmama gave me; but I should say that the tutorials I received from him were not only exhaustive but tremendously useful.

Perhaps I should mention here of his generous offer of a large monetary gift that he wished to make and the letter he wrote to my father. His marriage had unfortunately broken down and at that stage he did not foresee getting married again. And so he wished to think of me and my brother as suitable recipients of whatever money he was earning. In some measure he also looked

upon this as a return to my father for his hospitality and guidance which had been so important to launch his own career. However, my father, while appreciating the gesture, wrote back declining this handsome offer stating his wish that he may have a family of his own eventually when he would need the money. This wish of my father fructified in the next few years.

\* \* \*

Before I left for Bombay for my final departure to the U.K., I saw many friends and close acquaintances in the B.H.U. and received their best wishes. I knew that I was going for three years *at a stretch*, that I won't return till 1960 after receiving (hopefully!) a good degree at Cambridge. However, there were two hiccups before I was certain that I was going!

First, the passport. My passport application had been forwarded to Lucknow, the capital of U.P. state, where the regional office existed with jurisdiction over Banaras. After three to four months of waiting, as time for departure drew closer, my father got worried, especially when reminders did not produce any response. He finally sought the advice of his former colleague from B.H.U., Dr D.A. Kulkarni who held a senior post in the medical service of the state of U.P. Dr Kulkarni pulled a few strings and sent word back that if I came over personally, the passport would be handed over to me and this would save me time that might otherwise be wasted in bureaucratic dispatch. So I took a train to Lucknow and stayed with Dr Kulkarni who arranged for me to go to the passport office for collecting the passport. I got it without difficulty, but the incident was the first one I was to encounter of "Babuism", that is the force of red tape exerted by petty bureaucrats.

The second hurdle was in receiving the foreign exchange permit that would be needed for collecting Sterling currency in the U.K. in exchange for rupees in India. I had read previously how the country was passing through a foreign exchange crisis, brought along by an undisciplined expenditure of foreign exchange with which the country had embarked in 1947, on its new life as an independent nation. As its reserves fell drastically, draconian measures were deemed necessary and were enforced. So the amounts given to tourists going abroad were severely curtailed. Even the modest amounts needed by students were under close scrutiny. Thus when I did receive the precious permit at last, it brought a sigh of relief all round.

In this connection, I may recount an amusing experience I had with a close relative of mine in Kolhapur. This gentleman claimed to be an expert in

reading palms and even though I had a healthy skepticism of such claims, he insisted on reading my palm. One of his firm predictions was that although I would come close to going abroad that year, I would finally not make the trip because of some last-minute hurdle because, the lines on my palm did not predict foreign travel. At that stage I had not received my foreign exchange permit, and so there was room for this prophecy turning out right. As it was, I did go abroad, and when after my return I confronted the same ‘palm-expert’ with this instance of falsification of his prophecy, he coolly ‘recalled’ that what he had said was the exact opposite, namely that while I would think I would not be able to go abroad, some last minute development would enable me to go! I wish I had the prophecy written and signed at the time it was made!

One of my father’s friends, Professor Netravala of the College of Mining and Metallurgy, suggested that I go to his place for dinner and his wife would cook fish for me as an exercise in eating non-vegetarian food. I was glad of this opportunity and still recall with relish, the fish with mayonnaise cooked by Mrs Netravala on that occasion. This and the bacon prepared by Vasantmama were the only two instances of non-vegetarian food tried by me before leaving for England.

As I was doing the rounds of friends and mentors in BHU, my father sent me to meet a bright young man just out of Cambridge after a brilliant performance in economics. He was Amartya Sen, visiting the economics professor at BHU, Professor A.K. DasGupta. My conversation with Amartya was mostly one sided as I learnt a lot from him about the Cambridge atmosphere. He had just been elected Fellow of his college after winning the Adam Smith and Stevenson prizes at Cambridge. He promised to look me up when he was back at Trinity after spending a few months in the USA.

Because of the uncertainty of my leaving for Cambridge, I had, as a safety measure, joined the M.Sc. course of mathematics at the B.H.U. and my teachers included my father as well as Morumama who had joined the faculty. This was, however, for a short duration only as within a couple of months, all hurdles between Cambridge and me were cleared.

It was perhaps in the fitness of things that on the eve of my departure, my parents and I stayed in Bombay chez Vyasmama’s house, where we had spent many a happy vacation. My father recalled that prior to his departure for Cambridge, Narayanrao had regaled him and his friends and relations with an informal concert of classical music. Vyasmama also remembered this and said that he had already arranged an informal concert to be given by his son Atul (aka Vidyadhar, who later became a musician of repute and the Head of the

Music Department of Bombay University later occupying more senior national posts). Indeed, I recall it as a memorable evening and a fitting send off for me from a family so close to ours.

Another Tata scholar, Aubert Pereira, was also booked to travel on the same steamer. At the meeting with Mrs Vesugar prior to departure, she told us Tata Scholars not to forget to tip the cabin steward (she suggested £ 1) when leaving the steamer at the Tilbury docks. She also enjoined upon us that we must write to her regularly giving an account of how we were spending time at Cambridge (for me) and Birmingham (for Aubert).

Vasantmama also turned up with another set of practical suggestions. He had already lent me his overcoat and a camel-hair jacket for the winter that lay ahead. My father took me to see some older folk whose blessings and good wishes, he felt, I should have. These included, apart from Vyasmama, of course, Mr Apte who had been warden at his hostel in Elphinstone College during the late 1920s, and Mr Annasaheb Navare, the father of his first wife. Despite the tragedy of my father's first marriage, the Navare family had always maintained cordial relations with all of us and I still recall with affection the gift -packet of Rs 51/- that he gave me for this occasion. I had retained this packet unused for several years, more as a cherished memento.

On the morning of September 5<sup>th</sup>, accompanied by my parents and Vasantmama, I made my way to Ballard Pier Mole Station for the elaborate process of boarding the steamer. The area was full of people like me, travelers accompanied by their friends and relations come to see them off. Some passes were available for them to go on board and my parents as well as Vasantmama came aboard with me. I was taken to my cabin with part of my luggage, the rest being put in 'hold' to be made available at Tilbury. My cabin was on F-Deck, just above sea-level! (Later I met some passengers whose cabins were even one deck lower, at G, with the water level above the window.) The more you paid for the cabin, the higher deck you got. However, being a 'One-Class' steamer, one could move about all over the ship and enjoy the view and air from the upper decks or use the public facilities like reading rooms, lounges, games, etc.

We moved up and down so that my parents and Vasantmama could also have a quick view of the boat. Then Vasantmama offered to buy us all a soft drink in one of the bars there. We enquired with a British waiter if it was possible, since we would be paying in rupees. He said something and pointed to the bar seats. What did he say? I could not make out anything except the first word 'Please'. Vasantmama also could not fathom his cockney accent and

looked puzzled. My father, however, could make out what the waiter had said: "Please take a seat". We sat down and in due course he came to take orders and we had our orangeades. However, I was confronted with the difficulty I was to face now on: to make myself understood as well as to understand what people are saying. Neither the 'Banarasi' nor the 'Maharashtrian' accent would help me there.

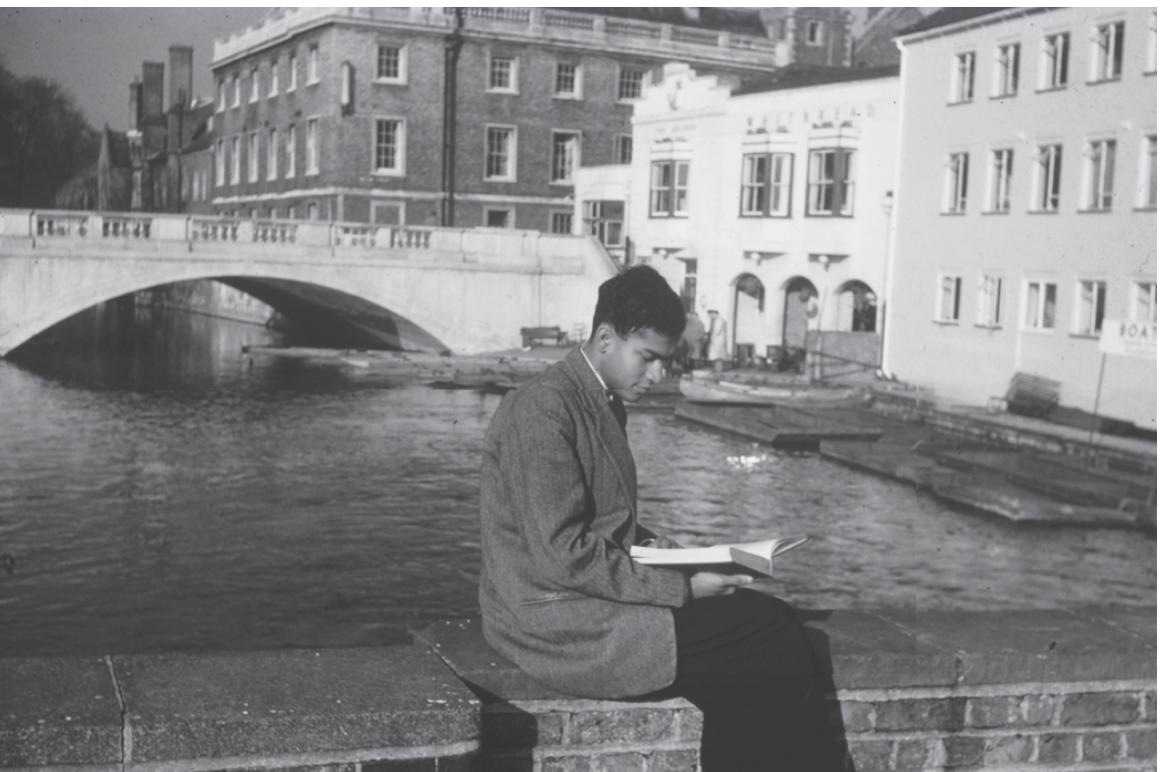
Soon there was the warning siren and those accompanying the passengers were requested to leave the board and go ashore. The moment of parting had come. I took leave of my parents, and was momentarily disturbed to see tears in my mother's eyes. Vasantmama stayed a little longer, perhaps to make sure that I was OK. He, of course, gave me a few more words of advice as he too eventually left.

I was aware that having studied as a 'day-scholar' all through my life till then, I was making a bold venture not just out of the four walls of my house but going far away from the shores of the country, to a lifestyle and environment totally different and alien. I was also aware that this trip would take me away from my family for three years, with no possibility of a 'mid-term break'. These aspects did lead to a certain amount of depression of spirits. I tried to balance it with the sense of adventure that lay ahead, boat travel for eighteen days, passage through the historic Suez Canal, which had just been reopened for civilian traffic following the aftermath of its nationalization and the hostilities that ensued with the misadventure of the British and the French. Then ahead lay England about which I had read in Charles Dickens, P.G. Wodehouse, W.W. Jacobs and Arthur Conan Doyle. England had changed, no doubt; the post-war England shorn of its empire was not what was depicted by these authors but it held a mystique with all its ancient traditions.

The boat moved and there was a cheer from those on board followed by those on shore. I could see my parents and Vasantmama, till the boat turned and made its way to the high seas. From a distance I could catch a view of the Marine Drive, never seen before from that angle. As it receded, it was brought home to me that I had finally left home.



# CAMBRIDGE



JVN as a student reading on the banks of river Cam.



## A PASSAGE TO ENGLAND

MY last view of Bombay faded into mist as the *S.S. Strathnaver* sailed to the west towards its next stop Aden. My parents and Vasantmama had been with me, the latter being amongst the last, to leave on the announcement "All visitors ashore". Just as I began to realize my loneliness, I had the unexpected visit by Madhuanna Phadnis, Yashwantrao Phadnis (relations on my father's side) and my cousin Ram, all of whom had managed to get on board thanks to the special contacts of Advocate Phadnis who had accompanied them. It was the advocate who had managed to pull a few strings in order to gain entry! One cannot imagine the informality of such a system operating today in the days of high security. But after they left, I felt really lonely and forsaken.

But new friends and acquaintances on board soon helped relieve the sadness of the occasion. I had already met Bezelil (Bezu) Benjamin who was amongst the four in my cabin, the others being Aubert Pareira and Shanbhag. Aubert I had already met in Mrs Vesugar's office in Bombay as a fellow Tata Scholar. Who knows, I might make new friends on this voyage?

The boat had moved off its moorings at 1.15 p.m. and at 1.30 p.m. I made my way towards the dining hall for lunch. What would it be like? I had decided to be adventurous and try any kind of food that was served. Since I was to live in the West for at least three years, I must get used to the western food. Having been a vegetarian all through my life, except for eggs (and of course, the trial of bacon by courtesy of Vasantmama and of fish, thanks to Mrs Netrawala), my sole knowledge of western food was based on reading

P.G. Wodehouse. Based on that, I ordered a steak, since this dish was often mentioned in PGW's novels!. It duly arrived and as I tried to cut it with my knife, I realized that it was no easy job. I looked up to see another young Indian in the same predicament. "I did not realize all meat was so tough!" I said by way of breaking the ice. He agreed and said: "I have some experience of eating meat but this is the toughest specimen that I have seen so far." Then he paused and added:

"By the way, my name is Chitre...Shashikumar Chitre."

So this was the famous scholar from Bombay, about whom I had heard so much. He had topped the Bombay University B.A. exams in mathematics and was going to Cambridge on the prestigious Cambridge Society scholarship. I had also heard that Chitre had been selected for a very remunerative job at the Lever Brothers (Who later became Hindustan Lever) but had declined the offer in favour of a career at Cambridge.

"I am Jayant Narlikar. I had heard about you and am very pleased to meet you.", I said diffidently. Apparently Chitre had heard of me too, for he extended his hand and shook mine saying that he had been looking forward to meeting me on this boat, but had not realized it that tough steaks would bring us close so soon!

Chitre told me to call him "Kumar". His easy manner really helped me overcome my home-sickness. At least I had got a friend who would be with me all through my Cambridge days.

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Steak apart, we enjoyed the lunch which was sumptuous. There were others at our table whom we came to know in due course, since our dining places were determined for all meals throughout the voyage. Indeed, as we discovered, we were in for an eating spree which daily began with a morning tea served in the cabin with biscuits or apple, followed by breakfast, then elevenses in the form of coffee or ice cream, then lunch and afternoon tea, with a big dinner at the end. Fortunately I did not suffer from sea-sickness and so could enjoy all the repasts.

The steamer was "one class", which meant that all parts of the boat were accessible to even the lowest fare paying passenger. The fare increased according to the level of the cabin, with the highest being charged to cabins on A-deck. Mine, on F-deck was just above the sea-level with the waves easily visible from the porthole. My berth number was 913. Chitre was one floor lower, being on

G-deck. Naturally we decided to spend most of the day on upper decks where all public facilities existed. The B-deck forward lounge soon became a favourite haunt and rendezvous for us. I discovered that the Ship's Library carried my favourite authors, Wodehouse, Agatha Christie, Edgar Wallace, etc.

*S.S. Strathnaver* was amongst the larger passenger steamers in the P&O fleet. The trend was slowly changing towards aeroplanes but boats were still the norms where one was travelling with a lot of baggage and where time was not of essence. Indeed today there are hardly any steamers of that kind in operation, the majority being dedicated to special luxury cruises. Thus no longer is it the case that between two places a boat costs less than a plane, as was the situation when I travelled. Our boat was a 22,000 tonner and carried 1253 passengers including 60 children and had 507 crew members. It carried washing and drying machines for washing clothes and this was a great convenience.

We were issued tickets for on-board entertainment. The tickets were of three different colours, lavender, yellow and green. This was a way of dividing the passengers so that each group could attend the shows in turn. Mine were yellow and I particularly enjoyed the Disney movies. We played table tennis, carom, cards etc also. I was not a good swimmer and so did not go for swimming in one of the pools. But there was plenty to do and enough room to do it. My father had told me that one should do some physical exercise to avoid getting overweight thanks to the food bonanza on board. I found that one could walk a lot if one simply went up and down on the upper decks.

On the first day itself we were given drill on how to go to the life boats in case of emergency. Having read about the *Titanic* disaster, the sinking of boats was very much on our mind, to say nothing of the disasters encountered by Sindabad on his voyages! In any case it turned out that except for a couple of occasions, once on the way to Aden and later in the Bay of Biscay, we had a smooth voyage.

On the first day itself, I had received telegrams from Anant and our family friend Professor Thawani wishing me bon-voyage. The boat was very well equipped for such messages. Also we could use the British air letters to send to India from the boat. I wrote my first letter home on 8<sup>th</sup> September, to be mailed by the boat at Aden. It is before me as I write this account. Thankfully, all my letters home from abroad were carefully preserved by my parents. These have enabled me to relive my days abroad besides bringing back a number of incidents that were either erased from my memorey or were getting defocussed with the passage of time.

By the time we reached Aden, our first halt, we were told to set back our watches by an hour and a half to match the local time. We received such instructions from time to time during the voyage as we crossed into different time zones. It was early afternoon and we disembarked to have a quick tour of the town, since the boat was scheduled to stay in port for a few hours. I moved in a party of five: Pareira, Benjamin, Chitre, Ranade and myself. Suresh Ranade was on deputation to London to work with Crompton Parkinson. One attraction for us was that Pareira had an aunt staying in Aden and we were very happy to meet her at the pier. She lived only a couple of hundred metres from there and we all tramped along to her place for orange squash, cake and sandwiches. Then we set out for exploring the town. We were wondering where to get some public transport for going into the city centre when another happy circumstance intervened.

The customs superintendent in Aden was an Indian, one Mr Subnis. Mrs Subnis hailed from Pune and their daughter-in-law knew Ranade. She saw us in the street and invited the gang to her house. Mr Subnis had three cars at his disposal and his son very kindly drove us to the Maidan, which is the market place of Aden. The ten mile drive went through hilly country and the Great Pass which was one of the beauty spots of Aden. Mr Subnis (Jr) also helped us bargain for merchandise and I bought two dacron shirts. Synthetic material was then newly coming into market and I had been advised by acquaintances in Bombay that I should, if possible, buy dacron shirts in Aden since they did not require ironing. The long sleeve shirts cost only twelve shillings each (- being a British protectorate, the UK currency was legal tender in Aden). Later I noticed, however, when I opened the well packed shirts that one of them was half-sleeve. The shop-keeper had the last word in our bargaining!

Anyway, it was my first experience on foreign soil. The drive and the atmosphere of an Arabic country were enjoyable and memorable. Indeed, being taken round by a 'local' is a privilege and my friends and I were fortunate to have had the help from Mr Subnis. He brought us back to the pier by around 6.15 p.m. and from there we went to the steamer by a launch. Because of ebbs and tides, the boat could not come right next to the pier. We sailed onwards at 7.30 p.m.

\* \* \*

The boat then went through the Red Sea towards its next destination, the

famous Suez Canal. Here an excursion was offered to the passengers at an extra cost: a conducted tour of Egypt (the Nile and the Pyramids) which started at Port Suez and ended at Port Said. Those who did not opt for it could continue to be on the boat as it sailed through the Suez Canal. As I was a student with a very limited budget, I chose the default option. In any case, I reasoned to myself that later in my life I will get a chance to visit Egypt and see the famous landmarks of its ancient civilization; but the chance of sailing through the Suez Canal may not be so easily available again. This line of thinking was vindicated subsequently although twelve years had elapsed before such an opportunity arose.

The Red Sea, however, was not as calm as the sea we had been through till now and the number of victims of sea-sickness increased. I might have felt a mild impact too. It was because of a choppy sea or because of stomach upset and heavy cold that I spent the next two days after Aden on fruits and tea or coffee. The water loaded at Aden for drinking tasted queer and that may have been another reason for foregoing it along with the food! An additional discomfort came through hot and humid weather, with the cabin (which was not air-conditioned) becoming unbearable. So we barely managed to snatch some sleep at night and then spent all our time on the open decks above.

Port Suez marked the beginning of the Suez canal. Those on the excursion left us for the day and we relaxed on the deck chairs. So this was the waterway that just a year or so previously had led to a fierce war. The relaxed atmosphere around us belied that recent history. There was desert on one side and fig trees on the other. There was a road by the side of the canal and we saw the Suez Railway also for a while. Evening brought us to Ismilia where a big picture of President Nasser greeted us. There was incense burning in front of it. I went to bed at around eleven and was woken up at two to discover that the boat had reached Port Said and was resting. But not the vendors on the banks. There were coloured lights decorating their shops and some of the salesmen had come on board by launches. Our excursionists must have returned too. Incidentally, my letter home mentions that the toll paid by the boat for crossing the canal was £ 7,200 , nearly a lac of rupees.

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When I woke up in the morning the boat had already made its way into the Mediterranean Sea and we were now in European backwaters. Here I received my first letter from home, for the letter mailed by my parents after seeing me off and reaching Banaras, caught up with me in Port Said. I was immensely

happy, and at the same time passed through a wave of homesickness on reading it. Some of my friends envied me for getting a letter except Ranade who regularly got letters at all intermediate ports. All of us started teasing him that he must be writing all these letters to himself!

This transition was celebrated by the boat on the 14<sup>th</sup> September, which also marked the half-way point in the Bombay-London voyage. The boat management organized a gala night on this occasion, when there was a festive atmosphere at dinner with balloons, crackers with little toys or coloured hats. In my letter sent from the writing room on the B Deck I have mentioned that the heat of the Middle East had given way to cooler weather from Europe. People who were informally dressed in shorts (I mention a clergyman dressed in shorts and white surplice now coming dressed in trousers and sweater) started becoming more formally dressed. The coast of Southern Europe became visible now and then through the mist, although the sunshine was still available in plenty. We were informed that we would be making our next halt at the southern French port of Marseilles on the 17<sup>th</sup> evening. The option of getting down here and making a quicker way to England was exercised by some passengers. For me, however, the more relaxed way of getting there on the 23<sup>rd</sup> September was much more preferable.

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Four of us Chitre, Benjamin and Pareira along with me together got down at Marseilles. I had read about the historic attempt to escape from captivity on a British boat by Swatantrya-Veer Savarkar. He had managed to get out from the toilet port hole and jump into sea, swim to the French shore and tried to escape into the dock area. Unfortunately, the British and French Police apprehended him probably somewhere in the vicinity of where we had got down. Perhaps one day the Government of India would manage to get the historic spot recognized by placing a plaque there. That evening, however, I could only imagine the incident happening ‘somewhere near there’.

There were excellent buses to go into the town centre at a cost of 70 French Franks. It was evening time and we strolled there, window-shopping. I saw a working television in a shop window. For the four of us this was the first view of the TV and it being a novelty we lingered on! Later we had coffee in a cafetaria and made our way back to the boat by midnight. The boat left around an hour later.

\* \* \*

Amongst the other Indians I met and saw a good deal of were one Dr Prasad from Bihar who had been a student of my father and who was on his way to the U.K. on a Government of India scholarship then available to university teachers for doing Ph.D. in the U.K. On our dining table was one South Indian, Mr Ramaswamy, who was also proceeding on some educational venture in London. I also saw a lot of Lord Sinha and his son Sunil whom I got to know well later too. Sunil was in fact going to Cambridge to do the Natural Sciences Tripos. For me one very useful person to know was Dr Shephard who had done the Mathematical Tripos and later Ph.D. in mathematics in Cambridge and who was now teaching in Birmingham University. He gave me a lot of tips about Cambridge.

The Bay of Biscay was a little turbulent and some passengers felt the effect. However, I had now got the ‘sea-legs’ and did not suffer. The weather was significantly cooler now.

On the 22<sup>nd</sup> we reached and made a brief halt at Brixham, our first stop in the British Isles. This was mainly to let some officers (customs, immigration, etc.) to come on board to deal with the disembarking formalities. We finally docked the next day at 10 am, at the Tilbury docks, our final destination and slowly the disembarkment began. An officer from the Indian High Commission, one Mr Acharya, had come on board to help us with accommodation in London. Chitre and I had decided to stay in London for some sightseeing and to go to Cambridge on the 27<sup>th</sup>. I and Pareira were accommodated in the Newlands Hotel directly opposite Russell Square underground station while Chitre was accommodated in the Indian Students’ Hostel on Guildford Street round the corner. Neither of the institutions exist today in those locations.

From the railway station right next to the docks we took the boat train to London with all our baggage. Arriving at the St Pancras Station in late afternoon, I was relieved to see two familiar faces, of persons who had come to meet my arrival: Miss Priyamvada Sah who had a brilliant career in mathematics at the B.H.U. and was now visiting the U.K. on a study tour, and Mr Krishnakant Shrikhande, a family friend. The latter had been amongst those who had bid me good bye prior to my departure from Bombay: it was a happy coincidence that he was there to greet me on arrival in London! I gave some packages that I had brought for Miss Sah. Miss Sah had flown into London a few days back and had brought me a letter from my mother. It was great to receive it right on arrival. They helped me put my main baggage in the left luggage section of St Pancras. Both Chitre and I had decided to take the Cambridge train from the King’s Cross Station which was right across the

road. [This important logistical information had been supplied to me in advance by none other than Vasantmama.] Sah and Shrikhande took me to my hotel and I had my first night in England in the Newlands.

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After a good English breakfast, Pareira and I decided to make our mandatory call at the Tata office in London. Captain Thomson was the man in charge of Tata Scholars in the U.K. and it was necessary to meet him and report our safe arrival. Moreover, as he was the one to pay our bills and to make our monthly allowances, we needed to know how the system operated. When I phoned him from a public call box at Russell Square tube station, he gave me instructions to come to Victoria and walk down Grosvenor Place (Vasantmama had told me that it was pronounced ‘Grovnar Place’) to the Tata Limited building. A sixpence ticket was sufficient to get there and we four including Chitre and Benjamin, who came for the ride, made our way there.

At Tata Limited, the rotund figure of Captain Thomson smilingly greeted us. We also met Mr Child, another officer at the Tata Limited. They gave me practical advice, especially stressing the merit of economy and also told how the allowance and other expenses would be paid. The allowance, some £ 2 per week, was not generous but comfortable if one spent it only on food not taken in College and on bus rides for work. The college and landlady’s bills would be paid directly by Tata Limited on being forwarded to them. He also told us that there would be the annual meet of all Tata Scholars for a pre-Christmas party, to which we would be invited. On such occasions, Tata Limited paid the travel expenses of the scholar attending the meet.

After our call at the Tata Limited, we made our way to the Buckingham Palace which was not too far, and then to Hyde park. Travelling on the tube was a novelty which we enjoyed very much, apart from admiring its smooth efficiency. Compared to the crowded Bombay locals, they seemed almost empty! In the three days we saw some of the landmarks of London. We also visited the India House and registered ourselves there as Indian students on study courses in the U.K. I made it a point to call on Mr Sathaye in the education department to thank him for all his help in securing my admission to Cambridge. He was happy to meet me and we kept in touch for the next few years while I was in Cambridge.

The Indian Students Hostel was not exactly an example of a nice and clean place. But it had one redeeming feature: one could get a good Indian

meal there for four shillings. We got one important practical information from the residents there, namely that an excellent self service cafeteria for Indian food existed for lunch on the seventh floor of India House. This was indeed a god-send to us. We ate there whenever we had the chance to do so on visits to London.

While in London during this visit, Chitre and I ran into one Major Fred Crittenden at the Alliance Club in the Russell Square area. We were looking up someone we knew who lived there and while we were talking to the lady at the reception mentioning that we were heading for Cambridge, one sophisticated voice behind us spoke up with an Oxford accent: "So you are headed for the other place! Pity, you could have chosen better." This was Mr Crittenden who was an Oxonian, of course. We were encountering the Oxbridge rivalry for the first time. Mr Crittenden introduced himself and wished us well at Cambridge and said that we should keep in touch with the Alliance Club (which had clean inexpensive guest rooms for visitors to London) and with himself.

So we did a whirlwind tour of London before winding our stay. The 27<sup>th</sup> morning saw us make our way to the St Pancras-Kings Cross station to board our train to Cambridge.

## SETTLING IN CAMBRIDGE

CHITRE and I took what must have been the slowest train from King's Cross to Cambridge. It stopped at practically every station en-route, taking some two and a half hours for the 55-mile distance. At the Cambridge station we separated, Chitre taking a cab to Peterhouse and I for my lodgings in Mill Road. My landlady, Mrs Muriel Fordham, had received my postcard sent from London announcing my arrival on the 27<sup>th</sup> September. So she was expecting me and greeted me with a welcoming smile and showed me my room which was on the first floor of the two-storey house.

First impressions are often the lasting ones. I felt at home within this house. It was a sunny morning and the room had windows which let in plenty of light. The furniture consisted of a bed, a wardrobe, a dressing table, shelves for books and other items, a writing table and chair, a coffee table and two sofa chairs. The room was spacious enough to accommodate all these without appearing crowded. However, *the house had no bathroom and had only an outside toilet*. Vasantmama had alerted me to this possibility as many houses in Britain did not have bathrooms. Nor was there a wash basin in the room: instead there was an ordinary basin with a jug of water. So in coming from India to the UK, I was moving into a more primitive environment than I had been accustomed to! As advised by Vasantmama, I decided to use the baths in my college or the public baths which the landlady assured me were close by.

In this context, there is a Cambridge anecdote dating back to the nineteenth century. One Cambridge college was making plans for adding more

buildings to its campus and its senior members while discussing the proposed students residential block, were debating whether to build bathrooms for the block. They decided against it on the grounds that the full term for which the students lived in college was hardly longer than eight weeks and the students did not need a bath for such a short period.

Mrs Fordham was a typical middle class British housewife. Her husband, Mr Fordham, worked in the Eastern Zone of British Rail and used to commute by train to the London terminus of Liverpool Street. Every working day, he would leave by the fastest train *The Fenman*, which left at 8.48 a.m. taking one hour and seven minutes nonstop to Liverpool Street. He returned by the same train in the evening. As his office was in the Liverpool Street station itself, he did not have to travel far in London.

After dumping my baggage in the house, I went to the nearest Lloyds Bank as directed by Mrs Fordham, and opened a deposit account there by cashing my travellers cheques (£ 25). As it happened, Mrs Fordham's daughter, June, was working there and so the bank was well known to her. June's husband, Geoffrey Harris, had a butcher's shop in Cambridge.

After dealing with these essentials, I moved on to the town centre to sort out any administrative matters relating to Cambridge University and my admission to Fitzwilliam.

\* \* \*

Cambridge University does not have a campus. Its constitution is also different from that of other universities (Oxford excepted, of course!) and so it is worth giving some details. First the academic structure is two-dimensional. Imagine a graph paper in which college names appear at regular intervals along the horizontal axis while different subjects are listed along the vertical axis. There is thus a range of colleges founded at different times right from the thirteenth century, and there is a range of university faculties and departments covering different subjects. So a student on our graph paper is indicated by a point to be identified by a college of which he is a member and a subject which he has come to study. The college looks after his accommodation and board as well as moral well being. The department or faculty ensures that he receives instruction in his subject through lectures and practicals. A student has a tutor in his college to guide him in his general social intercourse while he also has a director of studies in his college who appoints supervisors to guide him in his subject. So I had to meet my tutor as well as director of studies.

My tutor was Robert Norman Walters, whose field was English language. He impressed the student with his personality that included a heavy frame and genial demeanor. I always found him very helpful and friendly, right from my first encounter with him on arrival. I explained to him my relationship with Tata Limited in London, stating that at the end of each term he as my tutor would have to send Captain Thomson a confidential report on my performance.

Fitzwilliam House had been established in the nineteenth century as a supplement to the college system and was not in itself a college. This arrangement had been created for students who qualified intellectually for entry to Cambridge but could not afford the more expensive college life. Fitzwilliam became an autonomous college some six years later, in 1963. Till then it was under the control of the 'Non-Collegiate Students Board' of the University. Its head was called *Censor*, and the Censor fulfilled the role of the Master in a typical college. The students were often collectively referred to as *Fitzbillies*. I sensed a superiority complex in some of the students in colleges towards the Fitzbillies; the latter like me, did not feel any inferiority complex, however.

Mr W.W. Williams was the Censor. He had been one of the tutors when Vasantmama had been at Fitzwilliam and Vasantmama had given me a souvenir to be presented to him on his behalf. This I duly did and Mr Williams was very happy to receive it and to renew his contact with Vasantmama this way. He had also heard about my father who had been a Fitzbilly before his time and enquired about him. He hoped to meet him some day while I was at Fitzwilliam.

Vasantmama had given me several contact addresses of persons he had known in Cambridge. Since he had been in Cambridge till 1949, only eight years had elapsed and several of these persons were expected to be around in my time. [This was less likely in the case of my father who had left Cambridge twenty five years before.] One such person was F.E. Stoakley, Head of science section of the famous Cambridge bookshop *W. Heffers and Sons* in Petty Cury, a tiny lane in the central market area. I duly contacted Stoakley with a present from Vasantmama and again acquired a friendly contact at this bookshop. Stoakley had been a junior assistant at the time my father had been in Cambridge and remembered him well! I was discovering that in this place links with the past were strongly and intimately preserved. I was shortly to meet another person from the past in Heffers only!

As I was leaving Heffers, an old gentleman accosted me and asked my name. He was none other than Mr W.S. Thatcher, who had been Censor at the time of my father as well as Vasantmama. He had seen me wearing a

Fitzwilliam tie and since he had been specially in touch with the Indian students in Cambridge, he was keen to meet me anyway. Mr Thatcher had been in charge of the I.C.S. and later the I.A.S. probationers from India and also from similar organization in Pakistan, who used to come for one year training in Cambridge after passing their competitive examination.

Both Mr Williams and Mr Thatcher invited me to their homes. Williams lived in a large house in the nearby village of Great Shelford. I had a pleasant lunch there and thereafter he dropped me by car at Trumpington Village from where I walked home. By contrast Thatcher lived in a town house on a narrow lane close to the centre of Cambridge. He gave me coffee and cake and gave me very useful tips about England, Cambridge and life in general. Amongst other things, he recalled my father vividly and talked about him in affectionate terms.

And so I very smoothly slipped into the Cambridge routine at least as far as Fitzwilliam was concerned. I used to lunch there sometimes but had three compulsory dinners every week. The rest of the meals I had in my ‘digs’ as the lodgings were called in Cambridge. Mrs Fordham was a good cook and very accommodative to my tastes and likings of food. As a rule I had the typical English breakfast at home and then took a bus to Downing Street from where I could walk either to College or to my lectures. I discovered that the fare was twopence halfpenny if I boarded the bus right across from my lodgings and reduced to twopence only if I took it at the next stop by crossing the railway bridge.

But this was only part of the story! The other part of my settling down involved my main purpose in coming to Cambridge: viz. attending lectures for the Mathematical Tripos.

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The Cambridge Tripos examinations had their origin in oral exams. The examiners interviewed the candidate who sat on a stool (tripod) and faced the barrage of questions fired at him. That is how the word ‘tripos’ is believed to have come into existence. The name continued even after the examinations became written ones and no longer involved a tripod. The Mathematical Tripos is the oldest and the most prestigious of all the exams in all other subjects. The results of the examinations are read out by the Head of the Examiners from the balcony of the Senate House at the stroke of nine in the clock of the University Church of St Mary’s across the road. And after reading the results

the examiner throws copies of the result sheets down for the candidates to pick them up if they wished.

The nature of the examination has evolved over time as the profile of the subject itself has changed. In my days the examination was in three parts. Part I was the elementary beginner's part that took one year to study. This would normally be dropped by the students of B.Sc. level in Indian universities, *provided they were recognized for the purpose by Cambridge University*. The Part II took two years thereafter with the first year having a Preliminary Examination for Part II. After successfully negotiating Part II, the majority of students would take their B.A. degree and leave for professional jobs, including teaching in schools. However, those who wished to continue onto research went on to do Part III which took one year more. Thus all three parts done at normal pace required four years of studies.

My father's idea was that I should do the course in three years, dropping part I. However, B.H.U. was not recognized for this purpose though Bombay University was. In 1928, my father had been able to get exemption from the first part as he was a graduate of Bombay University, as could Kumar Chitre. But I was denied the facility and was required to do Part I as well. When I had been so informed before leaving, my father's next suggestion was that I should do both Part II and Part III at the end of the third year. Rules did permit this option.

So when I called on my Director of Studies in Mathematics, Dr R.A. Lyttleton of St John's College, I mentioned this option to him. He, however, told me that doing Parts II and III together would put too much strain on me and instead he proposed another option, which was also available. This involved my doing Part I and the Prelims to Part II together at the end of the first year and then part II at the end of the second year and Part III at the end of the third year. I too liked this option. Although I was then required to do two courses in the very first year at Cambridge, the Part I being not too tough for me, I could handle them with less difficulty than the earlier option of doing Parts II and III together. In retrospect I think it was a good decision and I will remain grateful to Dr Lyttleton for bringing it to my attention.

I also had informal advice of a similar kind from Dr J.C. Bulkil of Peterhouse who was Chitre's Director of Studies. When I called on Sir Harold and Lady Jeffreys of St John's College, again with a gift from Vasantmama (who had been Sir Harold's research student), they also encouraged me to follow the same strategy. Both of them were teaching in the Tripos. Incidentally, I saw the fattest cat I had ever encountered in the Jeffreys home. His name was

Figaro and it was fast asleep most of the time, except when feeding! He was quite a contrast from the thin Indian cats, which are for ever running around.

My father also agreed with this strategy and accordingly Dr Lyttleton arranged extra supervisions for me. He would himself supervise me with two other students for Part I, while for Part II he arranged Mr T.G. Murphy for pure mathematics and Dr F.G. Friedlander for applied mathematics. Murphy was a research student in St John's College while Friedlander was a senior faculty member. I found my supervisors different in their approaches, but all extremely helpful.

My letter home tells my mother my routine, that "I get up at seven, have a wash and get ready for breakfast at eight, leave the house at eight thirty and reach the Arts School Lecture rooms at five minutes to nine, just in time for the nine o'clock lecture. The lectures generally begin five minutes past the scheduled time and end five minutes before the scheduled time so as to allow the students and teachers to change lecture rooms. I have lunch in the college and return home unless there are supervisions in the afternoon. The landlady provides dinner at home except on the nights when I dine in Hall (meaning the dining hall of the college)".

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One important arrangement to be made on arrival was to register with a general practitioner (GP) who would look after the health problems. The national Health Service in the UK at the time was an excellent one, but to access specialists or hospital services one needed to go through the GP. Normally one chose a GP near one's place of stay. However, Chitre had been given the address of Dr H.F. Aphorpe-Webb who lived in Maids Causeway, Cambridge. He was brother of one of the trustees of Cambridge Society, Bombay from whom Chitre was receiving his scholarship. So I also went with him to register there.

This turned out to be a happy choice, for the Aphorpe-Webb family was very friendly and made us feel at home. I recall, on the first occasion we had just barged in without prior appointment, with Chitre carrying a letter from the Doctor's brother. The Doctor had some visitors for afternoon tea, and his wife invited us in very cordially. The registration formality was fairly simple, but it was comforting to know that we were now in touch with another friendly family in a foreign land.

Dr G.S. Mahajani had asked Chitre and me to meet his *Guru* in

Cambridge, Mr E. Cunningham. Mr Cunningham was a Senior Wrangler at the turn of the century and had taught several mathematicians who had become distinguished later, like Paul Dirac, Harold Jeffreys, Fred Hoyle, etc. So we went with some trepidation to his house on Huntingdon Road for tea (not barging in, but by prior invitation!) and were greeted by a very friendly couple. Both Mr and Mrs Cunningham were evidently happy to see us and through us to get news of their Indian ‘students’, Dr Mahajani and Shakuntala Paranjpye. I recall that Mr Cunningham dropped us in town after tea in his old Austin car. As I walked back to my digs I felt that here was another welcome home for us to frequent during our Cambridge days.

So within a few weeks of my arrival in Cambridge, I was finding my feet and had sorted out the various problems that naturally arise from such a major shift as this. Did I ever feel home-sick? Yes, on some special occasions like Diwali or family birthdays I felt the distance that separated me from my family and the knowledge that I would not be seeing them for around three years. It was a pleasure to meet the occasional visitor from B.H.U. or some friend of the family who happened to pass through Cambridge. I recall the first packet of some eatables that Chitre received from home and shared with me and some close friends. I wrote home about it and then packages of durable foodstuff began to come to me too. In those days when Indian eatables were comparatively rare in England, these occasional packages were a treat.

## THE FIRST YEAR AT CAMBRIDGE

MY letter home reads: ‘...although the Michaelmas Term ends on the 19<sup>th</sup> of December the Full Term goes on till the 6<sup>th</sup> of December’. It is an example of the many paradoxical Cambridge phrases. Why should the ‘full’ term be shorter than ‘term’? The definition clarifies that the Full Term is the minimum subset of the Term during which the student must be in residence, i.e., present on the campus. As mentioned earlier, the Cambridge terms are short and the lectures in the Michaelmas Term last eight weeks only which must fall during the Full Term.

My first term passed off very fast! What with the double-dose of lectures that I had elected to attend in order to pass two exams in the first year, along with the supervisions and study hours at home, those eight weeks were soon over. One highlight that I recall during this period was the Poppy Day on November 9. This was celebrated as a day of remembrance of the persons who died in the two world wars. The undergraduates on this day went on a collection spree for the Earl Haig Fund which provided support to the war veterans. They also staged numerous spectacular acts to entertain the public. The town as a tradition generously supported this fund collection effort and turned up in large numbers to watch the procession of college floats, the various rags and competitions for all and sundry. I had been given a set of raffle tickets to sell and was wondering how to go about it, when my landlady came to my aid. Her brother-in-law, Mr Fordham’s younger brother had been a casualty of the last war and so there was considerable sympathy for such efforts in the Fordham household. She therefore purchased the whole of my book of tickets!

As mentioned before, the students engaged in various rags for public entertainment on the Poppy Day. This included roof climbing, falling in a tub of cold water (on a cold November morning!), jousting of punts on the cam behind the King's College, setting fire to clothes and jumping in the river, etc. The main thrust of this activity was on the Trumpington Street, King's Parade, Trinity and St John's Street, and the town centre. The whole atmosphere was thus very different from the Guy Fawkes day that had been celebrated differently on November 5.

The Guy Fawkes day recalls the *gun powder plot* planned by Guy Fawkes in order to blow up the Parliament. Guy Fawkes was demonized and his effigy was burnt to the accompaniment of fireworks. On such occasions, mostly in the evening, there would be incidents of civil disorder. For example, there were some drunken fights between the undergraduates and the 'Teddy Boys', that is the town teenagers who had not enjoyed the privilege of university education. Raymond, Mrs Fordham's school going son had his own fireworks show in the back garden of the house.

During this period, Kumar Chitre and I used to meet every day. He was required to do only the preliminary. to the Part II of the Tripos and therefore had half my lecturing load. We used to meet in the Arts School where the lectures were held. One day he invited me to his rooms to taste the goodies he had received from home. Some Indian snacks like ladu, chivda had been airmailed to him by his parents. I enjoyed them and wrote about it home. This had the desired effect: within a few days I too received a food package! While I enjoyed the foodstuff and gave some items by way of a sample to my landlady who liked them, I was somewhat shocked to see the high value of postage stamps on the packet. So I wrote home suggesting sending future items of the long lasting kind by surface mail.

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For all freshmen, one initial formality to fulfill is that of matriculation. This has nothing to do with the matriculation examination of the kind we have in India. It simply means that the new students are presented to the Vice Chancellor and duly admitted to the university as students: "*statu pupillari*". For this purpose we, the freshers in Fitzwilliam, were due to appear before the V.C., sometime during the middle of the term. We were asked to turn up at the specified hour dressed in dark suits with ties and gowns. We marched in procession from the College to the Senate House led by our Praelector. There

we stood in a column four-abreast. When our turn came, we marched into the Senate House and were presented to the V.C. in rows of four at a time. The presentation and acceptance were in Latin, of course. Three years hence, (Insha Allah!) we would walk again in a similar column and be presented to the V.C. for our Cambridge degrees.

The university rules required that all students, research students, as well undergraduates must wear their gowns after dusk if they moved around on streets of Cambridge. To enforce this rule the university officials, the Senior and Junior Proctors wearing gowns and square hats (called mortar-boards) would prowl along the streets looking for students without this academic dress. If they spotted such a student they would ask the offender to see them the following morning in their office where he/she would be fined the standard amount of six shillings and eightpence. A student could risk running away, of course, and take shelter inside college walls where the proctor did not have access. This was one way the colleges showed their autonomy! But the proctor had two able-bodied assistants with him who were fast runners. They were called 'bull dogs' and they would give such a running student a fast chase. If they caught him and brought before the proctor, the latter could subject the offender to an increased fine.

In due course, I met other Indian students in Cambridge. In particular, I came to know the brothers Murali and Mukund both at Corpus Christie. Murali wanted to be an IAS like his father who had been in the British ICS, while Mukund opted for engineering. (Mukund, after a very productive career had been unfortunate in being in the midst of the Bhopal gas tragedy: he was the manager of Union Carbide in Bhopal at the time of the disaster.) Arun Adarkar at Caius was doing economics. His father B.N. Adarkar and uncle B.P. Adarkar had been contemporaries of my father. Through Chitre I also came to know Ashok Khosla at Peterhouse. Although I enjoyed the company of the two M's and Arun Adarkar, I used to feel 'left out' when they and Chitre would start reminiscing about their schools and colleges in Bombay!

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The British students normally leave for home at the conclusion of the Full Term; but the overseas students have to find something to do during the relatively extended vacation that follows. For me the choice was either to move to some other temporary lodgings or to continue in the existing one. I chose the latter option since I had by then well settled there and had found

Mrs Fordham a pleasant landlady who took good care of me. This also gave me the much needed time to catch up on the Tripos courses covered in the term just over. Nevertheless, I was advised to take a few days off to travel around the U.K. Mrs Vesugar, who wrote regularly in response to my letters reporting Cambridge life, enjoined me not to miss the Tata Tea party in the Christmas vacation.

The tea party was on the 19<sup>th</sup> of December and I decided to make a day-trip to London that day. The special day return by train to London cost only nine and six (meaning nine shillings and sixpence), which was the same as the single fare. The only restriction was that one could not depart on early morning trains like the Fenman which were used by the commuters to London. Kumar Chitre also decided to come with me, saying that he will see some friends while I went for the party.

The train brought us to London, Kings Cross at 1 o'clock and I had previously arranged for Ghanshyam Thawani to meet me there. Ghanshyam was a few years senior to me and had taken his engineering degree from the B.H.U. In fact, he was one of the many students who had enjoyed the hospitality of our house while in the university campus. His father, Professor V.D. Thawani, a statistician from the University of Gauhati, had been a very good friend of my father over many years. Ghanshyam had been studying at the University of Glasgow and was in London to spend a few days of his X-mas vacation.

Ghanshyam took us to an Indian restaurant where by chance we met Miss Priyamvada Sah, one of my visitors on arrival in London on September 23. We then visited the Indian Students Hostel where we met Benjamin, our fellow-voyager on the *S.S. Strathnaver*. After chatting for some time, Ghanshyam and I left for me to go to Hyde Park Corner for the Tata Tea party. Chitre stayed on with Benjamin exchanging their common reminiscences of Bombay life. At the Hyde Park Station I bid good bye to Ghanshyam and made my way to Tata Limited.

It was a pleasure to meet Captain Thomson again. This time he was very warm in his reception. I guessed that this was because my Tutor had sent a 'good' end of the term report about me! The tea party itself was sumptuous with various sandwiches, toasted tea cakes, scones, pastries and other kinds of cakes, juices and, of course tea. Certainly, after this repast I did not need any dinner! At the end there was a group photograph and also a Merry-Christmas and Happy New Year toast with sherry. Since I had decided to stay away from alcoholic drinks, I toasted with tomato juice.

On the way back it was quite dark, since the days were very short and the

Christmas illuminations were showing up everywhere. Chitre was waiting for me at the Kings Cross station as previously arranged. In fact, I encountered Benjamin ascending an escalator as I was descending one. So I had just missed him at the station. We managed to take the 7.50 p.m. train, reaching Cambridge at 9.30 p.m. Having reached home, I warmed myself with a mug of ovaltine. The day outing was successfully concluded.

On December 24, the Christmas Eve, I along with Kumar Chitre stood in the long queue in front of King's Chapel for the celebrated afternoon presentation of the Festival of Nine Lessons and Carols, which were to be broadcast on the national BBC radio live. We managed to get in and as I sat on one of the benches, I envied the Fellows of King's for their seats in the stalls of the famous Chapel whose construction was begun by Henry VI and completed by Henry VIII. I did not know then that one day I will have that privilege! The carols fully lived up to my high expectations and the programme remains a memorable event in my life.

The Christmas day itself dawned with the Fordham family wishing me merry Christmas and giving me a present from their X-mas tree. I had given them a box of chocolates which were of course very popular with young Raymond. Mrs Fordham had kindly invited me to the 'Christmas dinner', which meant the main meal at lunch time which I thoroughly enjoyed. She had been unable to get a turkey but the roast chicken with stuffing and roast potatoes was delicious, followed by the traditional Christmas pudding. There I learnt the tradition of hiding sixpence coin in the pudding for the lucky one to find it. Mrs Fordham was an excellent cook and even during my dinners there I used to enjoy good English food.

The next day, called the Boxing day, Chitre and I were invited to lunch with the Apthorpe-Webbs and there we had sample of what good but cold X-mas lunch is like. The cold turkey and salad were delicious. Here too we had the Christmas pudding. Mrs Apthorpe-Webb poured brandy on it and set fire to it. The pudding with burnt brandy was delicious. I thus had samples of two excellent Christmas meals, one hot and the other cold. (Chitre later confided to me that the previous day he had been invited by a family which traditionally had the hot meal on the Christmas eve and the cold meal on the Christmas day. So he had cold meals both days!)

I had also heard of the 'White Christmas', that is, snowfall on the Christmas Day. Indeed I had not seen snow yet and was eagerly waiting for the same. It did not come in December and I had to wait until late January for the first snowfall. It was an impressive sight at first, but later when the snow

got frozen and mixed with soil, it was not a pretty thing to watch or walk on.

Chitre and I had been advised by various friends that if we wanted to see England (or the U.K.) we should get on to the various vacation courses organized by the British Council. We indeed had received the booklet of the vacation course programme but were too late in applying for a vacation course during Christmas. So we decided to try our luck for the Easter vacation.

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In one of my weekly letters I had mentioned that Dr Lapwood from the mathematics faculty was the Senior Proctor and that he had a long time association with China. In fact Mr and Mrs Cunningham had spoken in greatly appreciative terms about him. My father wrote back, wondering whether he was the same E.R. Lapwood who had been a fellow-undergraduate with him at Cambridge. On checking details I was sure that this was the same person. My father then sent me a letter addressed to Dr Lapwood and asked me to call on him with the letter. Kumar Chitre said that he would also come along when I went to meet the Lapwoods..

Accordingly, one afternoon Kumar and I set out for his house on Long Road. Actually, as per the English protocol, I should have first written to Dr Lapwood or spoken on phone, seeking an appointment. Today I would do that even in India. But that time I was still very ‘raw’ and felt that dropping in unannounced would be OK, since Dr Lapwood was a friend of my father. But where was Long Road? From the Cambridge map it appeared that Long Road was fair distance away from the city centre, connecting Trumpington Road and Hills Road, beginnings of two long-distance highways emerging from Cambridge towards the South and the South-East.

We did not know, which way was closer and decided to take the Trumpington Road, which was closer from Chitre’s college. That turned out to be the wrong choice! We reached Long Road and discovered that at our end the house numbers were large, so we had to walk all the way down Long Road to number 17 and finally found the Lapwood house close to the Hills Road end. We barged in and knocked at the door. The door was opened by a teen-age girl who said that her father was not at home, but would be cycling in fairly soon.

So Kumar and I decided to walk around a little and then return after half an hour or so. We now took a short walk along the Hills Road. As we were sauntering down Hills Road, I was struck by the sight of a house with the name “Nasik” written on the gate. Nasik is an Indian city and we were

wondering how a house in Cambridge came to be named after an Indian city when an old lady gardening out there came to meet us. She greeted us and asked if we were from India. We replied in the affirmative and asked her our question. She said that her husband worked in Nasik in India for many years and their children were born there. When we mentioned that we were Marathi speaking persons from Maharashtra, she very cordially invited us to tea the following Sunday. Although we accepted, later some other thing cropped up and we could not make it. I wish we had been able to keep contact with her.

However, as we were returning to the Lapwood house, we saw him cycle towards it. We gave him ten minutes and knocked on the door again. This time he himself came to the door and when I explained the purpose of our visit, he invited us in. He and his family were sitting down to High Tea, the typical English version of early dinner. Although we had barged in uninvited, he and Mrs Lapwood insisted that we join them at the dining table. Dr Lapwood was very pleased to receive my father's letter.

The Lapwood family consisted of their eldest son Peter, daughter Jane, who had first opened the door to us, then a son Stephen and the youngest daughter Susan. Mrs Lapwood (or, Nancy as we later came to call her) and Ralph had met in China and had got married there. Both shared a deep affection for China and knew a lot about the country from several years spent there. Dr Lapwood knew my father well in the undergraduate days and asked me about him a great deal. He specifically asked me to inform my father about another friend of theirs, Carter, who now was a Professor of mathematics at Leeds University and, more importantly, had married Dr Lapwood's sister.

In retrospect, I feel that we were received by the Lapwood family with unusual warmth and this may have been due to his having spent a long time in the orient. He was therefore able to make allowance for our rather 'un-English' behaviour in dropping in without prior appointment. The Lapwoods always welcomed us to their house on several occasions.

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Chitre and I were well in time to apply for an Easter course of the British Council; we chose the course on Scilly Isles, a group of islands off the south coast of Cornwall. We got places on the course and very much looked forward to spending a week on this holiday. The time of the year was late March, when the spring would be just beginning and the days getting longer. After a long drawn out winter that would be something to look forward to.

We took the fastest train, the Fenman, to London, reaching Liverpool Street station in sixty eight minutes, a far cry from the slow train we had taken on our maiden journey from King's Cross to Cambridge. Our London contact was Benjamin in whose room we left our luggage for a few hours while we did some sight-seeing. We saw the house of Samuel Johnson, the criminal courts at Old Baily with the goddess of justice statue holding a balance, the buiding of New Scotland Yard, etc. Many landmarks that we had first met in our readings of English literature were now before our eyes. It was a thrilling experience. We had lunch in the India House at Aldwych in the seventh floor cafetaria with a self service counter. To us students deprived of Indian food in our daily routine and having occasionally encountered the typical Indian bureaucracy at our High Commission, it was a standard joke to say that the only efficient department of India House was on the seventh floor.

After a refreshing tea in the rooms of Miss Sah, where we tasted the upama after several months, we spent some time with Benjamin and then made our way to the Paddington station for the night train to Penzance. The train travelled slowly, leaving at 9.50 p.m. and reaching Penzance at 7.45 a.m. We had booked sleeper accommodation and to really wake us up after the sleep we had bed-tea in the train. That turned out to be an ill-advised step!

For, when we boarded the ship *R.M.S. Scillonian* from the Penzance quay within the hour of our arrival, we noted that the sea was very disturbed and the ship (tiny compared to the *Strathnaver*) was tossing up and down on the rolling waves. The journey was hardly three hours from Penzance to the island of St Mary's and both of us were confident that we had acquired sea-legs on the long voyage from Bombay to Tilbury. This is where we were to be proved wrong. The boat ride was far different from what we had been through in the Bombay-London voyage. The boat rocked and rolled ceaselessly and we soon joined the fairly large group of passengers being sick all over! It was unbelievable to see the sailors staffing the boat, walking steadily and negotiating unconcerned this disturbed frame of reference. It was a relief to see land approach. The only consolation to us was to be told that this was an exceptionally rough crossing and that normally there is not much tossing about. We kept our fingers crossed for our return a week later.

There were around twenty students on this course and we were put up in a few guest houses. Kumar and I along with another Indian student from Cambridge, Naresh Chand, were guests of Stanley and Howard. Stanley was the cook and Howard looked after the general arrangements. In retrospect, I

suspect that they were a gay couple, although at the time we were unaware of this mode of living. We were very well looked after, sumptuously fed and taken on various trips in different islands, like Tresco, St Agnes, etc. The weather was milder than in Cambridge and fortunately we had many sunny days. The botanical garden on Tresco had many tropical plants and the administration of the island was given to the Dorien Smith family whose big house and estate gave me some idea of what the Blandings Castle in Wodehouse novels may have been like. The British Council course officers were with us, occasionally organizing lecture-cum-slide shows or guided tours to acquaint us with the local history and geography.

The return trip to Penzance was quite calm with the sea behaving itself. We landed in time to catch the early afternoon train to London. We spent the night in the Indian Students' Hostel. Our plans to watch the Oxford-Cambridge boat race were vitiated by rain. We took the easy option of watching it on the television. The Hostel Warden Mrs Kumar very kindly allowed us to watch the race on her telly. Cambridge won, much to our satisfaction, although I suspect Mrs Kumar's sympathies lay with Oxford. We returned to Cambridge by an evening train.

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The Easter term began in April. As the days got longer and longer and climate milder and milder, the attraction of outdoors increased. However, at the end of this short lecture term, there lay the examination. Or, rather two of them. One of the lecturers for the prelims that I liked and who continued the lectures from the previous (Lent) term was Fred Hoyle, a colourful personality who had just been made the Plumian Professor of Astronomy and Experimental Philosophy. He was well known as popularizer of science and his lectures took considerable excursions beyond the syllabus. I was happy to get new perspectives on electromagnetic theory from him. At the time I of course did not envisage that I would have the privilege of being one of his long time collaborators.

Amartya Sen, whom I had met in B.H.U. before leaving for the U.K., had been abroad when I arrived in Cambridge. But he looked me up after his return to Cambridge where he was Fellow of Trinity and I had chats with him in the company of other Indians in his suite of rooms in Trinity. Living out in the digs, I was also missing the 'college life' typical of Cambridge and Sen's Fellow's apartment looked luxurious, to say nothing of the privileges enjoyed by Fellows of dining on the High Table and walking on the lawns of their

college. At the time I hoped but did not envisage that one day I too would enjoy the fellowship of a college.

The month of April and most of May went in feverish preparations for the exams. Occasional tea-invitations let me keep in touch with Mr Cunningham, Mr Thatcher, The Jeffreys couple, Mr Williams, the Lapwoods, etc. All of them in their subtle way helped me keep my morale for the tests that lay ahead. Food packets from home kept on arriving with regularity, although by sea mail. In one I could sample the Maharashtrian delicacy of Chiroti.

Although my attention was focussed on the two exams, Part I in late May and the Prelims to Part II in early June, I was also keeping an eye on the long vacation that would follow at the end of the Easter term. Nearly four months of it would have allowed me to make a trip home. Staying at home would have saved me money enough to have balanced the cost of the air fare. However, Mrs Vesugar strongly advised against it. She felt that I should stay on and see more of the U.K. and also try to visit the Continent if an opportunity presented itself.

On the latter front, my father suggested visiting the Dilwalis who were in Rome. Mr Dilwali had been his student at the BHU and had kept in touch with our family since the early 1940s. He was by then a senior official in the UN at New York and had been on deputation to the FAO in Rome. I knew Mrs Dilwali as a very affectionate person who was also an excellent cook! So I was indeed hopeful of visiting them while in the U.K. However, although they would have been very happy to welcome me, Mr Dilwali had been assigned some touring jobs by the FAO that summer and so by mutual convenience we decided to postpone the visit to the summer of 1959.

Finally, Monday, May 26 arrived when I was to face the first of my Tripos examinations. Our seating had been arranged in the University Library which had been a familiar haunt for me for books, mathematical or otherwise. The system turned out to be more informal than at home where considerable secrecy prevails, regarding who the examiner is, what is the name of the candidate normally identified by a roll number only. Here one wrote one's name and college on the answer book. The paper used for the answer sheets was of excellent quality. We were expected to write the solution of each problem on a separate set of sheets and discard any sheets used for rough work. The examiner would be present on the day of the paper, in case any clarification was needed. I felt that if basic integrity of the system is maintained by everybody, then the conduct of the examination can be a fair and friendly affair.

In my report back home, I wrote that in the Part I exams, I could manage

10+8+9+10+8+9 questions in the six papers. Since the expected number per paper was around 6 for a first class, and the maximum in each paper was 10, I felt reasonably confident of securing a first. With the prelims it was a different story. We had been warned by our supervisors that often the prelim to part II carries more difficult questions than Part II itself! Anyway, here my performance was a little over the first class standard in the two papers of pure maths and much better in the two applied papers. Both the exams carried the rubrics that ‘more credit would be given for complete answers than to a proportionate number of fragments’. In short, doing two halves of different questions would not be equivalent to doing one whole question. Again, I felt the difference between this rule and the Indian system.

A further difference was in the time taken for evaluation. The results are traditionally announced on specific June dates, stated like ‘the Monday after the second Sunday in June’, leaving hardly a period longer than 2-3 weeks. The results of Parts I- III were due to be announced on the Thursday after the second Sunday in June. And so on June 12, I made my way to the Senate House for the announcements of the results.

This was something of a ritual. The Chairman of the Examiners of Parts II and III announced the result from the inside balcony of the Senate House while the interested undergraduates would be present down below in academic dress. The Chairman waited until the Clock in the University Church of St Mary struck nine and then after saluting the assembly by raising his mortar board, he started reading the results in alphabetical order of surnames. In the case of Part II, he first read the names of Wranglers (those in the first class), then the list of Senior Optimes and then Junior Optimes. Although I was not a candidate for these exams, I was treating this experience as a dress rehearsal: for next year I would be standing here agonizing as to whether the name “Narlikar, J.V., Fitzwilliam” would be read out amongst the Wranglers.

After the results were read out the sheets were thrown down from the balcony by the Chairman of the Examiners. Those interested would collect them as mementos. Watching the happy and sad faces in the throng, Chitre and I came out and went to the notice boards on the side walls of the Senate House where these results would be posted. We found that the notice boards already carried the results of my two exams and I was relieved and delighted to see that I had a first in both. Chitre and Naresh Chand were not so fortunate. Both had missed the first class in the prelims and had to be satisfied with a II-1 (upper second).

My immediate step after receiving their congratulations was to make my

way to the General Post Office on St Andrews Street. Going over to the cables/telegrams counter, I asked for the rates of cables. I was told that if I wished to have a faster rate I could pay by the word whereas a longer message could be sent slower and cheaper. I opted for the former, addressing the cable to Vasantmama in Pune University, which had the telegraphic address ‘Unipoona’ and by way of the message just two words “Double First”. The clerk at the counter saw the message and extended his hand to congratulate me. As my parents were visiting Vasantmama in Pune, I knew the message would get to them before the next morning. In fact they got it that very night. I received the congratulatory cable from my parents and Vasantmama the next day.

Then I had congratulations from all the elders who used to invite me to their homes for tea. Mr Walters told me in confidence that I had topped the Part I exams and was placed third in the Prelims. As per his information, I had scored 81, 106, 160 and 146 marks in the four prelim papers. In each paper, the marks are supposed to be out of 100; but there is no limit on how many questions are attempted (subject of course to importance given to the complete question). That is how I ended up scoring 493 out of 400. The tutor said that considering that I was facing the burden of two exams the same year, this performance was not bad. I knew that in the Englishman’s language ‘not bad’ means ‘very good’ or ‘excellent’.

Although greater challenges now lay ahead, I was getting confidence in myself, knowing that in alien and more difficult circumstances, hard work and regular habits can pay dividend. Although one calendar year was still to pass since I arrived in Cambridge, this conclusion of the first academical year was indeed a happy one for me.

## TRAVELLING AROUND

**A**S mentioned in the last chapter, I had the long vacation to spend after the end of the Easter term. After the rigours of the Tripos, the relief after good results was immense. The month of June was a warm and generally dry period when Cambridge celebrated the ‘May Week’ and the ‘May Races’.

The ‘May Week’ is another typical Cambridge phrase and really means ‘a fortnight in June’. This is a week of celebrations when students organize ‘May Balls’ and other parties. The balls are organized in colleges and last the whole night. Some enthusiastic young couples then punt to Grantchester and have breakfast in the Orchard. One saw smartly dressed couples in the evenings heading for their college balls all fresh and alert. They would be seen emerging from the college early next morning looking wan and tired.

Like the May balls, the May Races are also held in June. The races are between boats of colleges. However, unlike an ordinary race in which all participants line up and start in parallel routes for the same end, here the boats are one behind the other. The goal of each boat (except the one at the head of the column) is to catch up on the boat in front and bump it. The boat at the head, of course, tries to keep ahead and not get bumped by its follower. This arrangement is needed because, unlike the Thames, the local river, the Cam, is very narrow and allows only one boat at a time. The races go on for four days. Whenever a boat bumps its target, both the boats withdraw from the race which continues. It then allows the boat behind to catch up and bump the

boat ahead of the boat just bumped. This is a rare feat to accomplish but if achieved, it is registered as a ‘double bump’. The races go on for four days, each day fresh alignment is made with the boat which was bumped and the boat which bumped it, interchanging places. In this way, a fast boat can move up with the aim of ultimately becoming the ‘Head of the River’ boat. This may take several years of persistent effort since each year one begins with the position at the end of last year’s race.

Similar races are held in the Lent term too, in the month of March, but then the weather is not so pleasant. Naturally, the May Races attract greater attendance and pageantry than the Lent Races. There are several divisions too, so that colleges try to enter their fastest boat for the top (first) division, while the less speedy crews take up lower divisions. In my time, the Fitzwilliam first boat was not very high up, but it reached the top position within a decade or so. Interestingly, their best boat was called *W.S. Thatcher*. Through races like these as well as on other wider stretches of the rivers in the local region, both Oxford and Cambridge select and groom the crews for the annual competition between the two rivals.

Of course, for a typical undergraduate, Cambridge life will not have been fully sampled, until one has punted on the river. Having very scanty knowledge of swimming, I was hesitant to get up on the punting platform and started my practice of pushing and steering the punt from the wrong (Oxford) end. This does not have the platform and although punting on it reduces the efficiency, it is safer. Later, after getting the hang of the exercise, I switched over to the correct end.

Undergraduates like to organize some major prank also during this post-exams period. I recall the city of Cambridge waking up to find a car mounted on the roof of the Senate House! How did it get there? The national press arrived to photograph the bizarre sight while the fire brigade was called to get it down. Alas, even they could not manage to do that and so the proctors announced an amnesty for those who played the prank, provided they came and undid it! They emerged from their anonymity and explained how the trick was done and got the vehicle down.

During this period we had a visit from Drs Arun and Sahashikant Mahajani, sons of Drs G.S. and V.S. Mahajani who had studied in Cambridge in the 1920s. With them we went to St Johns College where their parents had been undergraduates. The porter showed us the rooms they had occupied while in College and even went further back in time by showing us the rooms occupied by Sir R.P. Paranjpye, who had been the first Indian Senior Wrangler

at the turn of the century. This thread of continuity from one generation to another has been a Cambridge speciality.

All along as the summer arrived, I had been anxious to sample strawberries and cream. This desire was fulfilled when I was invited by the Williamses at their Shelford home for lunch. The dessert was the very same strawberries and cream. Although I had visited the Williams home earlier also, in summer their garden was beautiful with various blooms and plants.

Towards the end of June the last year batch of undergraduates ‘go down’ for ever and are anxious to dispose of some of their possessions at fairly cheap rates. I was on a lookout for the popular undergraduate conveyance, the bicycle and did not have to look far! The landlady opposite, Mrs Roberts (aunt of Mr Barrett, the Chief Clerk at Fitzwilliam) was a great friend of Mrs Fordham. She sent a message to me that she had a bicycle left by her boarder, one Mr Rao, and it could be had for £ 2.10s only. It had a dynamo and three gears and most importantly its seat was low enough for me to put my feet down when the bicycle was at rest. I jumped at the offer and found my transport problem greatly solved this way. I had the bicycle for several years, until I moved to live in the city centre.

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Even during the term, after the pressure of the exams was in the past, I took a short weekend trip organized by the British Council to Stratford Upon Avon, the birthplace of William Shakespeare. It was a unique experience to see the landmarks associated with the poet and playwright, to appreciate how carefully the links with the past are preserved. In India, we merely pay lip service to ‘our ancient heritage’ without doing anything about preserving links with it. We were treated to two Shakespearean plays at the local theatre built to commemorate Shakespeare’s works: *The Twelfth Night* and *Romeo and Juliet*. Both plays had a very good cast, and began promptly on time—again a contrast with plays back home.

During our first London visit, Chitre and I had encountered Major Crittenden from the Alliance Club. Although we had exchanged addresses, we had no correspondence. That was why, I was surprised when one fine morning I received an invitation from the Major to attend a summer camp in Keswick, in the Lake District, during July that year. The camp was arranged by the Inter Varsity Fellowship (IVF), an organization dealing with university students. Although I would have to bear my travel costs, the IVF would provide

local hospitality. As this gave me an opportunity of seeing the much talked of beautiful corner of North-West England, besides sharing camp-life with other students, I jumped at the opportunity. Chitre, however could not make it. Much though I enjoyed the experience, I tested the varacity of the maxim: 'There is no such thing as a free lunch'.

There was a special train for the campers (there may have been around two hundred of them) from London, Euston to Keswick. I boarded it and it went nonstop as it had no other passengers to pick up on the way. At Keswick, there was a large farm which was to be used as camp-site. I later discovered that farmers in summer welcomed campers to their farms which were not being used for growing any produce. I knew one fellow undergraduate who had joined this camp, Dennis Webster, whose family came from Kenya, where his father was a clergyman. In fact, Dennis was also aiming to take holy orders. We often used to chat about our countries, Kenya then being still under the British rule and trying to learn from the Indian experience.

However, we all soon occupied ourselves with helping setting our tents and other facilities. I was wondering what they did for bathrooms and toilets and I found that these were also set up in army fashion. We were to spend a week at the camp. The routine, besides having food at breakfast and dinner times, was to have some lectures to the students for 30-60 minutes both after breakfast and at dinner time. These were about Christianity and how salvation can come only through following its tenets.

I, being brought up by birth a Hindu, although then not a very devout one, I had found the tolerant philosophy of Hinduism easy to accept and assimilate. It permits the individual to adopt any of a variety of paths towards self-improvement. It does not frown on other religions too. Against that background I found the theme, often repeated in the lectures at the IVF, that only through Jesus Christ one can attain salvation, hard to justify, let alone accept. I had some discussions with the fellow-students there most of whom were practicing Christians. I ran into a Bengalee student, who was a Hindu, and was deeply worried. He confessed that there was great pressure on him to convert to Christianity. There were weak moments when he felt persuaded by the arguments given for it and might take the plunge, although deep in his heart he did not think it was a wise step. I could then see that the purpose behind inviting some of us to the camp with its evangelical colour was to gain some converts to Christianity. I do not know what eventually happened to my Bengalee friend, but so far as I was concerned, seeing the intolerant theme underneath the thinking, I became even more appreciative of the tolerance

displayed by the Hindu religion. For the same reason I have never felt attracted towards Islam either.

These matters of soul apart, so far as the body was concerned, I enjoyed the trip enormously. We had the main part of the long day free with organized walking tours and bus as well as boat trips. The weather was as usual a mixed bag of rain and sun, making me appreciate the sun even more than in India where we sometimes have too much of it. This was my first acquaintance with the Lake District and I fell in love with the region. There were many happy trips that I would make to these parts in my future years in the United Kingdom.

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My earlier plan to visit the Dilwalis in Italy having been postponed to the next year, I did not envisage a trip to the Continent in 1958. However, an unexpected opportunity came my way of seeing the World Fair in Brusselles. My father wrote that one of his young friends from Banaras, Father Jean Mercier, a Belgian catholic priest, had suggested that as there was going to be a world fair in Brusselles that summer, his family in that city would be very happy to host my visit to them so that I could see this unique international exhibition. He mentioned that his father was an industrialist in Belgium with property in what was known then as the African colony of Belgian Congo. Their house was big and they would have no problem in having a guest like me. In fact, subsequently I got a letter in Hindi by Father Jean himself extending the invitation on his parents' behalf and suggesting that I write to them indicating when I would like to visit.

I wrote to Father Mercier's parents and immediately got a cordial invitation. They mentioned that they hardly spoke any English but will have some English friends to translate French to English and vice versa. Mme Mercier (mother of Father Jean) wrote what train I could take and where I should get down. With this invitation, it was no problem to get the Belgian visa and arrange my train bookings for a one week visit.

I planned first to travel with Chitre to London in early August and stay in the Indian Students Hostel for a week or so. Then I would travel to Belgium for a week and after my return, Chitre and I would go to Edinburgh on a British Council course, to attend the Music (and Cultural) Festival there. We would be back in Cambridge in September.

My week in London was spent in more sight-seeing in the company of Chitre and Benjamin. We also saw the play *Mousetrap* based on an Agatha

Christie murder mystery. It had been running at the Ambassador theatre for several years and continued to create records. Given this background, I was expecting it to be much better than what I actually found. Often disappointment is in store when one goes with high expectations.

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The trip to Brusselss worked out as planned. From Victoria the boat train took me to Dover where after the ferry crossing to Ostend, I got on to the Brusselss train which I found much faster and more modern than the British train I had travelled on from Victoria. Mme Mercier had come to the Midi station and had brought along an English lady, Mrs Warnott. They had a big chauffeur driven Chrysler waiting outside which took us to their palatial residence on Avenue Moliere. There I met M. Mercier and Mr Warnott. I was given a suite of rooms with a bathroom containing the largest bath tub I have ever seen. In fact, when filled with water, I was scared to take a dip lest I lose my balance and get drowned in it!

The Merciers were extremely hospitable and anxious to know how their son, who had taken to priesthood, was getting on. Since I had met Father Jean in Banaras, I could give them some first hand information (which Mrs Warnott translated for them). Because of language problem our conversation was slow, but still we got on well. As it was, M. Mercier was a man of few words and it was Mme Mercier who liked to chat.

They took me to the World Fair premises the next morning and I was very impressed at the magnitude of the whole enterprise. There were pavilions of different countries as well as major international organizations depicting achievements and future perspectives; the entire conglomeration being dominated by the 'Atomium', a tall structure depicting chemical binding in an atom with huge glass components into which one could enter and view the scene below. Naturally there was a lift to go up! The view from the top was fantastic. Although the fair is no more, the atomium is a lasting structure and can be visited even today. This was just like the Eiffel Tower which was built at the time of the 1889 World Fair. Today the Tower still survives as an important landmark of Paris.

My memory today is vague on the details but the lasting imprssion has been of a very impressive set of displays that could keep you there for many days. I think I visited the Fair for five days and even so could not do it full justice. The projected marvels of technology (which have since become routine

today) impressed me most. The fact that the projections became reality so soon conveys the speed with which science and technology are entering our lives. I was disappointed, however, that the Indian contribution was not so eye-catching.

The Merciers treated me with great affection and were lavish with hospitality. They took me to various restaurants where I could sample varieties of Belgian food. Although they put their car and chauffeur at my disposal for going to the Fair each day, I often took the tram which I found much faster than the Bombay version and the journey took about fifty minutes whereas the car took half an hour. One day, Mme Mercier took me to the town centre and we saw a lot of the interesting buildings and statues, art gallery etc. On the penultimate day, the Merciers planned a family picnic to Jeanloo, their country cottage named after Father Jean, which was near the historic battlefield of Waterloo. We saw the famous lion memorial of the battle. The extended Mercier family, the two brothers of Father Jean were there with their children and we all had an extremely enjoyable picnic in their country cottage.

The next day, I had to catch my train back and transport myself from all that luxury to the mundane life of an Indian student in England. But I had pleasant experiences to sustain me and I have always cherished my wonderful week with a very kind and generous couple.

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After spending 2-3 days in London, Chitre and I set off for Edinburgh. In addition to the vacation course of the British Council we had the cordial invitation from Arun Mahajani to spend a few days there. At the time Edinburgh and London were the Mecca of surgeons aspiring for the F.R.C.S. status. Arun was preparing for the exams and there were other Indian doctors in the same boat there. So we expected to have an Indian week after the British Council course.

After our sojourn in London, this time we took a motor coach to Edinburgh from the Victoria Coach Station. This was before the days of motorways and so travel time in Britain was quite long. After a morning start, we finally reached the digs where Arun was staying by 11 p.m, a journey of some 14 hours. We spent the night there and the next morning moved to Balfour Hall where the course participants were to stay. Balfour Hall is a Women's hostel of the University of Edinburgh. Students like us get accommodation there during the summer vacation. All fifty of us could be

accommodated in single and double rooms. We were given tickets for the various performances of the Edinburgh Festival. These included operas, ballets, concerts, plays and any new art form for the stage. We were therefore able to see some of the best performers in very ideal settings. In addition, we were privileged to see the Military Tattoo against the background of the famous and historic castle. These performances were largely in the evening and to keep us occupied, the British Council also showed us some of the historic and scenic landmarks of Edinburgh during the day.

After the course was over, we left Balfour Hall to return to the lodgings where Arun Mahajani was staying. We had the company of his landlady's family, the Campbells whose toddler son Roy provided us with a lot of amusement. We also took a day tour of Glasgow and Loch Lomond whose bonny bonny banks were very pretty indeed. The Princes Street in Edinburgh is described as one which illustrates what is a straight line in Euclid's geometry! It was here that while doing window shopping we ran into the famous and popular Maharashtrian couple, Mr P.L. Deshpande and Sunitabai Deshpande. When they learnt that we were from Cambridge, they mentioned that they were on a study tour and would be visiting Cambridge in a few weeks. Chitre and I very cordially offered to show them round the town and the university. We had that privilege later in November.

The return journey to London was by the night coach which had a toilet, a convenience that greatly impressed me. Also Chitre and I had been discovering that if we were not pressed for time, the motor coaches were a lot cheaper to travel than the trains. Returning to Cambridge also by coach, I was happy to see a food parcel from home waiting for me which contained my favourite Diwali sweet 'Chirota'. To me, being thousands of miles away from home, the chirota signalled Diwali rather than vice versa.

My letter home dated the 19<sup>th</sup> of September, gives an approximate account of my expenses during the first year in the U.K. Against today's inflated prices these figures look ridiculously small: expenses on the steamer and in London on landing, £ 10, College bills including refundable caution money £ 214, landlady's bills £ 160, Tata allowance and other extras £ 146. The total of £ 530 was comfortably below the Reserve Bank of India's limit for Oxbridge. It was also significantly lower than Chitre's expenses because of the higher costs of staying in college. Mrs Vesugar of the Tata Endowment was naturally very pleased. Indeed, I became something of an embarrassment to other Tata Scholars who were henceforth enjoined by Mrs V to follow my example in thrift.

The College allows the undergraduate to change the lodgings at the end of the year. In a typical college in those days, an undergraduate would live in college for one or two of his three years. The remaining period was spent in lodgings or digs. Fitzwilliam had no residential buildings then and so all its students lived in digs through the years. By rules, I could have changed my digs for something closer and with better facilities. However, the Fordham family were extremely nice to me and I decided to put up with the physical inconveniences in favour of a warm and hospitable family.

## THE YEAR OF THE WRANGLER

THE October of 1958 began with hordes of freshmen lining up against various offices, a phenomenon I could look at with detachment, having gone through the experience the previous year. In the first year, I had the benefit of supervision by Dr Lyttleton of St John's, a distinguished astronomer who had been the Director of Studies in Mathematics at Fitzwilliam. Apart from himself supervising me for Part I of the Tripos, he had assigned Mr Tim Murphy for pure maths and Dr F.G. Friedlander for applied maths, for the prelims to Part II. During my second year he was no longer the Director of Studies, a position now occupied by Mr Bill Yates who also took help from Dr Lapwood in arranging our supervisions for the Part II of the Tripos. For Part II, Dr Lapwood sent me to Dr Screaten of Emmanuel for applied maths and Mr Carter of Sydney Sussex for pure maths. My co-supervisee was one Jones from Sydney Sussex who had stood ninth in the prelims. I had been very fortunate with my supervisors the previous year and this being the year when I would be aspiring to become a 'wrangler', I hoped that I would continue with the run of good luck.

Perhaps I should mention here an amusing sidelight on the Oxbridge system. The lecture schedule for the term appears in the *Cambridge University Reporter* (the university house journal) in a specific issue at the beginning of the Full Term. I was puzzled to see some lecturers listed as "Mr" even though they were Ph.Ds. I was told that the title of "Doctor" is applied only to those who received their Ph.Ds from Oxford or Cambridge! The doctorate degrees

from the rest of the universities were thus unrecognized in a subtle way. I believe the practice has ceased for some years now. Another anomaly that had existed earlier and had been corrected by my time was concerned with degrees for women. Till 1948, women were not given degrees at Oxbridge, even though they qualified for the same by examinations.

The tripos lectures that I now attended were mainly for Part II and a few for the so-called introductory courses for Part III. The latter were meant for those who next year intended to go in for Part III. These courses were not to be examined for Part II. Amongst such lectures were those by the new incumbent of the Rouse Ball Chair, Professor Davenport on number theory. A former Cambridge man, Professor Davenport had come over from London University. I found his lectures very illuminating. This year I also had Dr Lapwood lecturing on elasticity and gravitation. He was a very good and systematic teacher.

I had now evolved my own method of preparation, that of writing out all my lecture notes in a neat and comprehensive manner, filling in the gaps left by the lecturer. This practice stood me in good stead, especially when I had to face a very traumatic experience in a few months.

Cambridge had only three women's colleges (Girton, Newnham and later New Hall) as against more than twenty men's colleges. Even so, a general impression created about the typical Cambridge woman undergraduate was that she was brainy (since she got into Cambridge) but not necessarily attractive as a woman. One joke I had heard at the time went as follows: One professor of geography was describing an island where the female to male population ratio was very small. "Even Cambridge women would be able to get husbands there" he added laughingly. This, of course, did not go down well with the girl students in the class who staged a walk out in protest. Whereupon, the professor called out: "Oh don't rush! The boat for the island is not leaving yet."

One of the attractions of Cambridge for me had been the Cambridge Union, a club of distinction to which many famous Cambridge men had belonged when they were undergraduates. [The Club in my days was still a male bastion!] Both the Oxford and Cambridge Unions were known for their debates to which even the leading politicians, (many of whom were old boys of Oxbridge and belonged to the Union of their university,) fished for invitation. I became a life member in my first year and enjoyed the club facilities like afternoon teas, lunches and dinners at relatively low cost.

But the debates were well worth the reputation they enjoyed. Invited speakers wore the evening dress (white tie) and during the debate a certain

protocol of the kind followed in the Houses of Parliament, was observed. When a speaker was speaking, he could be interrupted by any member who simply stood up. The speaker then would stop speaking and let the intervention go ahead. He would reply to the comment and then proceed. It was all very polite and at the end of the debate the members would file out of one of the three doors: 'Aye's, on the right for those in favour of the motion, 'No'es, on the left for those against it, while those wishing to abstain would come out of the central exit. Tellers would be standing at the exits to do the head count. The result as to whether the motion was carried or lost would be pasted on the notice board shortly. The traditional first debate of the year is on the motion: "This House has no confidence in Her Majesty's Government". Even the Prime Minister would sometime come to speak in defence of the Government.

In my second year, this motion was debated apart from the local undergraduate speakers, by guest speakers Mr Douglas Houghton, M.P. and the Right Honourable Edward Heath, M.P., the first one from the labour party speaking for the motion and the latter from the tory ranks. Mr Heath was then the Government Chief Whip and was to become the Prime Minister some twelve years later. The motion was carried by 450 ayes against 176 noes. What impressed me most was that even amongst the members not officially speaking, some had come well prepared with documentary evidence to present whenever they felt that a particular speaker was not telling the facts. It was a debate of the highest quality and even undergraduates did not hesitate to contradict distinguished politicians with well-prepared interventions. Some of the undergraduates I heard speak in the Union later became distinguished statesmen. While listening to these debates, I felt that I was observing the cradle of democracy from which Britain's long standing parliamentary democracy evolved. Although we have copied the British model, we do not have such training grounds for future parliamentarians in India.

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A few months after I left for Cambridge, Morumama went to Moscow under a Government of India scholarship programme with the U.S.S.R. He was at the time a lecturer in the mathematics department of B.H.U. and had been interested in algebra. He therefore was lucky to have the opportunity of doing research under the guidance of the famous algebraist Kurosh. He went there along with a group of other students in different fields, including one Mr Shukla from B.H.U. who hailed from the Chemistry Department.

When Morumama was studying for his M.Sc. in B.H.U. we had been quite close. He had encouraged me to look at various aspects of maths by posing challenge problems to me. He was always keenly interested in politics and I recall his emotional attachment to the issue of 'Samyukta Maharashtra' which had started brewing in the mid-1950s. He would comment very scathingly on the various political personalities with whom he disagreed, not sparing even Nehru. These comments were for the benefit of whosoever happened to be around, except my father who inspired awe in him. In fact my mother used to be very apprehensive lest some of her brother's frank comments fell on my father's ears.

We had continued to correspond after I had left for Cambridge and now after reaching Moscow, Morumama began sending equally frank comments on the Soviet system of life in his air-letters. Some milder versions reached my parents and these were enough to worry my father: would the Russians who probably scanned all letters see these negative comments and forthwith deport (or worse!) Morumama back to India? It is just as well that he did not see the letters I received.

Anyway, those letters indicated that while the academic levels in the Soviet Union in the 1958-62 period were high, the living conditions were by no means so comfortable as in the west. The curb on civil rights was an even worse contrast with the free press of the west. In fact when I suggested to him to make a trip to Cambridge during his summer vacation and he had accumulated some money for travel, he declined, saying that seeing Cambridge would make him feel worse for his lot in Moscow.

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In Edinburgh, Chitre and I had run into Mr P.L. Deshpande and Smt Sunitabai and had offered to show them round Cambridge if they ever made the trip. Fortunately, in their crowded itinerary they were able to fit in a two day visit and we welcomed them on October 25-26. We showed them round the various landmarks of Cambridge: by now we had acquired enough expertise and experience of being guides and could suit the length of our 'conducted tour' to any length of time ranging from one hour to two-three days!

It was a pleasure seeing Cambridge with the Deshpandes, hearing anecdotes and 'puns' from PL and occasional sharp but perceptive comments from Sunitabai. They were interested in the vast University Library where I could show them also the oriental section in which Indian literature was

displayed. In the evening we took them to a play called *The Entertainer* in the Arts Theatre. I mentioned to them that this theatre owed a lot for its creation and existence to Lord Keynes, the famous economist at King's College who was a patron of the arts.

The next morning we took them to the University Church of St Mary's for a service since he wished to attend a typical service in a university church. The sermon that day was on the apartheid (colour bar) in South Africa and on racial discrimination in general. We will remember very well the afternoon in Chitre's rooms where we had tea and then PL read out to us the last chapter of his famous humourous book *Batatyachi Chawl*. We then saw them off at the railway station for the 5.15 train to London.

Later we were interested to see the whole trip described in PL's book on his European trip in 1958: *Apoorvai*. It was a revelation to see how his observant eye had seen and recorded events that we had missed or ignored. This was apart from his own inimitable style dotted with wit and humour. Our only disappointment at reading the description was that it nowhere mentioned us while describing the entire Cambridge visit!

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Every College has a chaplain and in Fitzwilliam we had the Rev. Peter Schneider. An ebullient man married to a quiet but very friendly lady, Peter (as he wanted all undergraduates to address him as) seemed at first a somewhat abrupt personality to me and as I was not a Christian I felt that he and I would not have much to say to each other. However, I was wrong! Peter turned out to be a very informal and free going person and soon made me feel quite at home.

At Fitzwilliam we had a mutual friend, a Japanese student named Kuzetoshi Hasegawa, usually known as 'Cousin' for "Kuzin". He belonged to a very rich family in the TV manufacturing business in Japan. Cousin had a fast car at his disposal with a convertible roof and also claimed to have the second best camera in the world which then cost around £ 150. But in spite of all these symptoms of rich living Cousin was very friendly and helpful and avoided being patronising.

I recall our first outing in Cousin's car. He and Peter and a couple of other undergraduates besides myself got into his car on a fine afternoon. At Peter's advice Cousin took us to the charming village of Hemmingford Grey where we had tea and then after a short stroll we drove back. I also recall being taken by him to a Saki-party where the local Japanese had gathered to drink Saki (rice wine) and eat Styaki with it.

The Christmas lunch this year (1958) was at Chez Peter where Cousin was also invited. We had hot roast turkey and all the usual accompaniments followed by the Christmas pudding. It was a heavy meal at the conclusion of which we watched the television broadcast of the Queen's traditional birthday message to the nation. Later, as it was a fine afternoon, Peter suggested that we went for a walk. And a long walk it turned out to be...to Trumpington from there to Grantchester and back along the footpath by the river. It was indeed needed to counter the heavy meal that we had. We ended by having a light supper with the Schneiders.

Apart from Peter Schneider, I had another hospitable person in Cambridge for occasional meals. I was introduced by an African friend to an elderly lady Mrs Fritsch, widow of the late Professor Fritsch of Botany and related to the famous Cambridge nuclear physicist of the same name. Mrs Fritsch liked to meet students from the developing nations and would invite them for chats over meals. She was an excellent cook of European food and I always looked forward to her invitations.

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That Christmas vacation I went to the Tata Tea Party as in the previous year. It was an enjoyable affair and it was a pleasure to meet Sir Frederick James and Mr Saklatwala. This time (unlike on the previous occasion) I had a successful first year behind me and the authorities at the Tata Limited were very pleased to receive me and to tell the other scholars about my success.

After the tea, I went to see the Christmas decorations on the Regent Street and in the Oxford Street area as well as the giant Christmas Tree presented by the kingdom of Norway. It was a very spectacular sight to see and the crowds despite the cold weather were quite large.

There had been a snowfall in the second week of December and we were hoping that the same would be repeated on the Christmas Day. However, we were denied a White Christmas this year also.

Anyway, it was with the realization of the approaching examinations in June that I now decided to concentrate more on studies and less on touring. After more than a year at Cambridge I was feeling very much at home and capable of dealing with the small problems of daily living as they came. Little did I know that my staid routine was to be shattered in an unexpected way.

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My letter home dated 8 February is a fairly routine one mentioning how I enjoyed watching on the TV the *Nightwatchman's Stories*, based on the humorous stories about sailors by W.W. Jacobs which I had read (or heard from Tai as narration) in my schooldays, expecting to visit North Wales in the Easter vacation on a British Council tour, stating that I had gone to watch a college rugby match in which an English friend of mine, Terry McRae was playing, the first time ever I saw rugby being played, and how one of my lecturers, Mr L.A. Pars talked to me asking if I was Narlikar, as he recalled lecturing to my father in the twenties. On the tenth of February, I was to have a routine medical check up which was scheduled in the morning.

My regular way back to my digs in the evening, when not on a bicycle, was to cut across Downing College on to Regents Street, and to catch the bus 102 from there to Mill Road. [I had figured it out that if I caught the bus one stop earlier, the fare went up from twopence to twopence halfpenny!]. I took this path on the ninth February, but as I approached the Downing back gate which opened out on the Tennis Court Road, I was knocked by an approaching scooter which came round the corner. The scooter driver should have taken evasive action to prevent the collision just as I should have seen the approaching vehicle; somehow absorbed in thinking about something I was not so careful of the surroundings and paid the price. I had the feeling of receiving a hard knock that threw me some distance and as I landed on the pavement, I was conscious but perhaps under a shock and disoriented. The rider stopped and came to find out how I was. Realizing that I needed professional attention he, as well as one of the few onlookers on the spot, probably went to call an ambulance. Fortunately, the accident took place just behind the Addenbrookes Hospital, and so could not have been at a more 'convenient' spot! I recall an ambulance arriving, into which I was lifted. The paramedic talked softly and informed me that I had probably broken my left leg, where the wheel of the scooter had hit me. He very slowly turned the leg around broken spot and asked me if it hurt. Whether I was still in shock, I do not know, but it did not hurt and I recall looking at the bent part and wondering that with such a significant break in the bone it will ever heal. Even in that disturbed state I wondered if I would lose the lower part of the leg.

I was taken to the emergency ward. Discovering that I was from Fitzwilliam, from my college scarf, the Hospital got in touch with the college authorities and very soon I had visits from my tutor Mr Walters and Chaplain Peter Schneider. They assured me that I was in good hands, that they will inform my parents and that I do not need to worry. Although the doctors first

put the broken leg in plaster, the experts later opined that surgery was needed in which a steel plate would be screwed in around the broken bone to provide additional support. The consultant who was to perform this operation was no less a person than Mr Butler, the famous orthopedic surgeon who had recently operated on a Saudi prince. This involved an operation under general anaesthetic and this was performed in a few hours on the following morning. I was 'promised' that I should be able to move around within a week.

In the meantime I had a stream of visitors. My landlady had been informed...she would have started worrying if I did not show up by ten in the night. She came to see me and brought a letter from my parents that had just arrived. Mr Williams, Mr Walters and the Rev. Schneider, from Fitzwilliam were frequent visitors. Peter gave me a chess and draughts set and board and taught me how to play draughts. He also had the tact (?) to manage to lose the first chess game he played with me. Dr Lapwood also visited as did Mr Thatcher who came despite feeling weak after a bout with flu'. Kumar Chitre and other friends came and the nurses remarked that I seemed to be very popular in having so many visitors. Even Dr W.W. Grave who had taken charge as the new Censor of Fitzwilliam came to enquire after my health.

I was brought fruit and various sweets as well as reading matter to while away my time. For, in the first few days I was not supposed to get up from the bed. Mr Walters brought C.P. Snow's novel *The Masters* which was based on a true story about the intrigues around the election of a new master in a Cambridge college. He had marked in pencil the names of the 'real characters' against those in the fiction. I also read the *Black Cloud* by Fred Hoyle. I had already encountered Hoyle as a very interesting lecturer and it was fascinating to read this piece of science fiction. Little did I imagine at the time that one day I would have the privilege of working with him.

I was of course missing the Lent Term lectures and at the time was not worried as I believed that I should be out of the hospital within a couple of weeks. Still, it was nice to know that Mr Lyttleton had offered to supervise me in the Easter vacation if I needed help with the lost portions.

In about ten days I was shifted from Addenbrookes Hospital to its nursing home called Douglas House where patients requiring no significant medical attention, but who, like me needed to be under observation, were transferred in order to make room for the patients needing urgent or serious treatment. Going in an ambulance in fresh air was refreshing after being bedridden for so many days. However, I had been a little disappointed that I was not sent back to my lodgings. The plaster also was not a very easy thing to carry... it was put

all the way from waist down to the foot, leaving the toes open for ventilation.

"Here is some more of your fan mail" ,said the sister as she handed me the daily mail. Indeed I had been fortunate in receiving mail from my Cambridge friends cheering me up and generally writing something to boost my morale. The physical pain had disappeared, especially after the stitches were removed. The plaster had to be cut away to remove the stitches and I secretly hoped that I had seen it off for ever, at least the full length version of it. But, alas, no! It was put back on. I would look to its replacement by a kneelength version after three to four weeks. Mr Townsend, the doctor who took post-operative care of patients like me took an X-ray and confirmed that the healing was going on well. He then asked the nursing staff to train me to walk about using crutches.

Amongst other visitors, I had also the visit from a Cambridge policeman who wanted to note down all the details of the accident. After noting all the details he said that although in principle I could claim damages if I felt that the mistake lay with the scooter rider, in practice he would advise letting the matter rest where it was. My tutor also advised the same. The scooter rider had also visited and chatted with me stating how he was sorry that this had happened and that he had not been able to sleep that night. I had realized that the fault lay with us both, I had not been attentive enough while crossing the road nor had he been alert enough to brake while so near the corner. So, of course, I did not press any charges.

Life at Doglous House was fairly relaxed. I had a room to myself with plenty of reading material. Visitors were allowed between 2.30 to 3.30 p.m. on weekends and Wednesdays, and from 7.30 to 8 p.m. on the rest of the days. The first letter from home (after the news was conveyed to my parents by a letter from my tutor) arrived within about 10-12 days. My parents, though very disturbed and worried about me, were reassured that I was getting good attention and, as my successive letters showed them, I was improving in health as well as morale. One of my neighbouring patients was a young man of my age who came now and then and we played chess. Our levels were not very different and so we won or lost with approximately equal frequency. One evening Peter sprang a surprise. He brought curry and rice from an Indian restaurant! Indian food was certainly welcome as a change.

On the seventh of March, less than four weeks from the accident, I was at last permitted to go home. Before that, the nursing staff had trained me to use crutches not only for normal walking but also for ascending and descending the stairs. The operation was non-trivial since I could not bend my plastered

leg at the knee joint. The nurses also made sure that I could put on my clothes, pyjamas, shirt and trousers, etc. by myself. The pain had almost gone and I was in fact getting impatient about the removal of the plaster. This is when one realizes that patients really need to be patient.

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By a happy coincidence, a food parcel with goodies from India was awaiting my arrival at 200 Mill Road. For the first few days after my return, I was really pampered by my landlady. She gave me the use of her sitting room downstairs so as to avoid my going upstairs and downstairs (for the use of the toilet) during the daytime. She helped by fetching things from my room upstairs whenever needed. And of course, she prepared those dishes specially, which she knew I liked.

Peter Schneider was anxious that I should get around in fresh air and so he very kindly arranged that some wealthy friends of mine from Fitzwilliam came and gave me car rides in the countryside. So I had Cousin Hasegawa and Terry McCray coming with their cars to take me to the small hamlets dotted round Cambridge, where I not only had fresh air but the typical English afternoon tea.

By the time I returned, the lectures for the Lent Term were drawing to a close. I therefore decided that my going to the last couple of days for the lectures will serve no purpose and I decided to stay put at home and work on my notes. I borrowed Kumar Chitre's notes and rewrote them as fair notes (which had been my practice anyway). I was relieved to see that with the help of suitable texts I could follow the notes well and fill in any gaps as required.

In the meantime, my tutor and Peter Schneider both proposed a 10-day holiday for me in North Devon to help recuperation. A Christian working group was spending 3 weeks or so in a large house called Lee Abbey at Lynton in Devon. These students were from various colleges in Oxford and Cambridge, who used the Easter vacation to read something of theological nature, hold discussions and organize informal lectures. Some of them preferred to earn some money doing physical work and found work in the vast garden of Lee Abbey.

Peter made all the arrangements for my visit. A bus had been chartered to leave Cambridge on the morning of March 14 to take the Cambridge party to Lynton. He got Cousin to come with his car to fetch me to the Senate House from where the bus was scheduled to leave. Peter had also come to

ensure that I got on all right and that the driver and others knew about my ‘special condition’. The bus came at 8.20 and after everybody had got on with luggage, left at 8.35 a.m., about twenty minutes late. Those were days when England had no motorways and journey was necessarily slower. We reached Hendon at 10 a.m., to collect a few more students and after going via the London Airport, Reading, Marlborough (where we stopped for lunch), Bridgewater, Minehead and Lynmouth finally arrived at Lee Abbey at 7.30 p.m. I was impressed that this heavy coach could manoeuvre through narrow and sometimes steep turnings (a few carried the warning that the incline was 1 in 4). Also, what impressed me most as coming from India was that the driver sounded the horn but once during the entire 250-mile (400 km) journey from Cambridge. Towards the end of the journey we were close to the south coast and got occasional glimpses of the sea.

The Lee Abbey was a typical large English country house capable of accommodating 100 guests. It was located on the top of a coastal hill so that from several rooms one could see the coastline. The grounds were specious, some 260 acres of them; so those who had opted to do physical work had plenty to do. My bedroom was well provided for with heating and hot and cold running water, wardrobe, table and chair, etc. But I promptly decided to make the library my working abode, for it provided a stunning view of the coast and one could see golden sunlight coming in during the mornings. My work of writing and preparing notes continued here with little disturbance. Although I met the rest of the students at mealtimes, I was left to myself so far as their other academic schedule was concerned. I do recall two cats in the place, one of which always stayed in while the other roamed outside. Whenever they met (near the boundary of the house?) they fought. The students joked that despite living at the Abbey the cats were not impressed by Christian Fellowship!

The spring season was on and the weather was generally mild with frequent sunshine. I could venture out on short walks with my crutches, my typical range being around a quarter of a mile. But that was sufficient for me to come to special spots from where one could see the beauty of the Devon coast. Peter’s friend, John Lovel from Oxford had come with his family. They took me for a ride in the countryside so that I could see the scenic spots in the region like Hunter’s Inn, Woody Bay, Shallowford Farm, etc. In the last named place we had a farmhouse tea with thick Devon cream. John’s two and a half year old son Richard was puzzled that I was wearing only one shoe, since my plaster did not allow me to cover the other foot. He kept asking; “But where has the other

shoe gone?" He was finally satisfied when I told him that I had forgotten it at home. On another occasion, Rev. Tucker took me to Watersmeet along steep roads and beautiful look-outs.

I was able to make up on the lost portions of lectures while at Lee Abbey and thanks to the various drives in the countryside and the jovial life in the Abbey, my period there was delightfully spent. Although the rest of the party were to return later in a bus, special arrangement was needed to take me home. I had initially worried about this, but Peter had solved this problem also in his characteristic way. He mentioned this problem to the new Censor Dr Grave and he very readily agreed to come down to Devon to take me back to Cambridge in his car. Imagine someone, no less than a College Principal making a special trip of 400 km to bring back a student from his college! This was another example of the enormous goodwill I enjoyed in a land normally noted for coldness and formality.

The word reached me that on the 23<sup>rd</sup> of March, Dr and Mrs Grave would be arriving at Lee Abbey at 9.45 a.m. to fetch me. They turned up promptly and I was waiting for them at the gate with my suitcase. They put me into the back seat after some difficulty since I could not bend my leg. It was in any case impossible for me to sit on the front seat. This difficult operation over, I relaxed on the entire back seat with the leg stretched out diagonally and we set off. However, after having gone on for around half an hour, Dr Grave turned round and asked: "Narlikar, did you not have any luggage with you?" "Yes, I had. My suitcase was right beside me where I was standing" I replied. "Oh, My God! I don't think I took note of that" exclaimed Dr Grave and his wife stated the obvious: "We must turn round and get back to that suitcase, my dear." As we turned round I kept wondering whether the suitcase would still be there outside the gate, right by the highway, a full hour after it was left there. It was and we all breathed a sigh of relief. To me it was another example of a basic streak of honesty running through this nation. We had a fairly uneventful journey thereafter, reaching Cambridge in the evening.

As the Easter vacation drew to a close, I got ready for my lectures in the Easter term, which I intended to attend, even if this meant going plaster and crutches in the bus and then walking. My tutor asked me at the beginning of the term meeting, whether I wished to take a year's drop and appear in the exam the following year as I could still take both Part II and Part III together in the same year if I wished. No stigma would have been attached to such a drop in view of my accident. However, I felt confident and replied that I was

willing to face the challenge of the Tripos that very year. In Marathi I could have replied, “I am ready even on one leg” (*Eka payavar tayar ahe!*).

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I had Dr Lyttleton to supervise me for the applied maths while for pure maths I had a Chinese mathematician friend of Dr Lapwood, one Dr Wei. The presence of the full plaster I had got used to by now, although I was looking forward to the day when it would come off again. The toes emerging from the plaster at the end had to be covered by a ‘sock’ to prevent their freezing in the outside air. As no standard sock would fit the plaster-covered foot, I cut one and managed to have it put on. The ‘have it put on’ is important, since I could not reach that end with my hand. So Mrs Fordham did it just before I left home. Once or twice it slipped off on road or in a bus and was replaced back on by some kindly passer by on the road or a fellow passenger in the bus!

My social intercourse continued despite these problems. The Jeffreys, Lapwoods, Thachers, etc would invite me to a meal, sometimes some of us students would meet for tea or lunch. There were the very welcome visits from Dr Arun Mahajani. Once he turned up with Dr V.N. (Kishore) Shrikhande, who had already acquired the coveted four letters, F.R.C.S. after his name from both London and Edinburgh. Despite his achievements he was a modest man bubbling with enthusiasm, a trait that still exists in him in abundance as he runs a highly successful surgical practice in Mumbai. He wanted me to remind my parents that he had been present in the house of Mr Nana Saheb Puranik on September 5, 1957, the day my parents had called there after seeing me off on the boat to London.

The Indian cricket team had come to England for the summer and the early warm up matches before the first test match included one against Cambridge University at the university ground at Fennars. There was a 3 shilling ticket and I spent one day watching them play. The ground was full and the Indians put up a good performance against a rather mediocre opposition, winning the match easily. The British papers had already started saying that the Indian ‘fast’ bowlers did not inspire any fear in the minds of the batsmen.

Meanwhile, I had made progress with the leg. The full plaster was taken off in early April, but the doctors kept a knee-length one on with the foot being supplied with a plaster heel on which I could put weight as in normal walking. So I did not require the crutches anymore and gleefully returned

them to the hospital. A month and a half later that plaster was replaced by a lighter version that now freed my foot for sock and shoe. I could now walk with my usual speed and with no impediment, although I still had some period to go before the experts were satisfied that the entire plaster can be removed. The sensation when the full plaster came off was most peculiar. I felt that my leg (without the weight of the plaster) was almost about to fly off!

The Part II finally arrived! We were to sit for the examination in the same place as for Part I the previous year, viz., in the reading room of the University Library. I had liked that place and felt that I would be at home writing the papers there. The dates were June 1-3, with two papers per day as for Part I. I wrote home that I had got  $4+5+5+5+5+6 = 30$  questions right fully and the rest six completed in parts. In each paper we had to attempt six questions. So I had not done badly if my estimate of correct answers were correct! The very first paper on ‘dynamics’, one of my strong subjects, had proved to be very tough. I later learnt that the examiner was the astronomer mathematician Hermann Bondi from London and he had set one problem right out of his research paper! Lady Jeffreys later remarked to me that she had talked to Bondi and had jokingly chided him: “Hermann, you have butchered the students!”

The waiting period till the results due to be announced on June 18, was filled anxiously in various ways. Chitre and I along with two others from the subcontinent, Jamal Nazarul Islam from East Pakistan (now Bangladesh) and Naresh Chand who were all in the same state of nervousness, enquired with the various faculty members what would be the courses offered in the Part III Tripos next year. We had some sixty odd courses to choose from and we had to choose effectively six full courses. To be on the safer side one attended around eight courses so that one could expect to do a respectable number of questions. The arithmetic was simple. There were six papers and each course of 24 lectures generated three questions. Not more than three questions were expected to be answered in each paper. By now I had been attracted to astronomy related courses and the book *Frontiers of Astronomy* by Fred Hoyle had already acquainted me with the fascinating world of astrophysics wherein one uses mathematical applications of physics to understand astronomical phenomena. Cambridge had a strong tradition of astronomers trained as mathematicians, to name some: Jeans, Eddington, Larmour, Fowler, Chandrasekhar, Hoyle, Lyttleton, and of course my father.

The May Races took place as usual in June and I enjoyed visiting them one day. Naresh Chand invited us all to tea at his place and as a surprise he

produced some alphonso mangoes. We each had a small share but to recapture that delicious flavour after two years was a memorable experience. There was one disappointment in store for me when I next went to the Addenbrookes for my check up. The doctor last time had promised that the last remaining plaster would come off after this check up. This time, however, there was another doctor and he recommended that the plaster be continued for another four weeks, just to be on the safe side.

The Sunday before the results were to be announced we had a visit from Arun Mahajani and Kishor Shrikhande. This was an occasion to enjoy, particularly as Kishor gave us an Indian banquet to celebrate his double-F.R.C.S.

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The results of the Mathematical Tripos shall be announced on the Thursday after the second Sunday in June. So say the university rules. That was June 18 in the year 1959, the day of reckoning for me. All my work in Cambridge would now wait till just after nine in the morning for its result. When I reached the Senate House that morning at around ten to nine, several undergraduates from our year were already there and others would be coming in to join us. The Chairman of the Examiner, Dr J.W.S. Cassels duly appeared in the balcony and patiently waited till the clock on the University Church of Great St Mary's chimed the stroke of nine. Then doffing his mortar board he began reading the results as we all anxiously waited for our names to be announced.

I had been through this exercise the previous year, but then I was a disinterested observer, not a concerned party. Today, as the names were being read in alphabetical order beginning with the 'Wranglers', one knew where exactly one's name had a chance to be called. If it did not come and the list proceeded further, then you had it. I had already seen Chand's face drop, followed by Chitre and Islam as the list moved inexorably towards 'N' and then I heard what I wanted to hear: *Narlikar, J.V., Fitzwilliam*. Chitre silently extended his hand in congratulations. I was immensely relieved and happy though a little sad that my friends did not make it. They (all three) featured amongst the Senior Optimes.

My next task was as in the last year, to go to the Post Office in St Andrew's Street and to send off a one-word message 'Wrangler'. The man at the window who had remembered me from last year again conveyed his congratulations. The cable was sent to Vasantmama whom my parents were visiting at the time.

Their reply came next day, equally short, congratulating me. But I knew, how particularly happy my father must be feeling with this news.

This was, however, the beginning. For even on this day of heady joy I recalled Vasantmama's words to me before I left India "Wranglership is fine; it will give you a solid foundation in mathematics. But treat it as a beginning. Your real success will come in how well you perform on the research front" So it was not the end but a beginning; I had to look ahead first to Part III which will open the gates to the world of research. Not everyone of those who did well today will choose to go that way. Many wranglers became school teachers. Some went to industry. My path lay, along with around one third of these, in the direction of Part III.

## THE FINAL UNDERGRADUATE YEAR

AFTER the euphoria of success, I called upon my tutor Mr Walters the same day as the results were out. He was extremely pleased with my success, more so as my college did not have many wranglers to boast about as Trinity and John's had. The ranking of wranglers had been kept a strict secret from students, although the faculty might know it unofficially. This was the outcome of a decision taken in 1909 when Senior Wranglership was abolished. Till then the Tripos students were ranked all the way from top to the bottom of the passing list. The top one, who enjoyed all the accolades was called Senior Wrangler, while the bottom of the list was (unofficially) called the 'wooden spoon'. This peculiar designation owed its origin to a practice which was informal but had acquired the status of a ritual. It consisted of the lowering of a wooden spoon from the balcony of the Senate House down to the candidate by his fellow undergraduates from the college, at the moment he knelt before the Vice Chancellor to receive his degree. All that had ceased since 1909.

After he congratulated me on my performance, I asked my Tutor whether he knew my rank. He smiled and said that he had been told but could not reveal it to me. He then added that he felt that I could not have done b....! He did not complete the last word. Was he trying to tell me what I needed to know? His Sphinx-like face did not reveal the answer and so I had to remain satisfied with that reply. Some other sources subsequently also led me to believe that I had topped the list, or at least come very close to that. Walters also

raised the more pertinent issue of my plans after Part III and was pleased to learn that I wanted to go on to do research, preferably at Cambridge. I was already developing liking for astronomy and astrophysics and Cambridge was certainly one of the best places for this field. Walters said that the Isaac Newton Studentship, which was usually given to a student who topped in astronomy at Part III, was a possibility if I continued to do as well the next year. My father had been a recipient of this studentship after he won the Tyson Medal given to the best astronomy student at Part III (then called Part II, Schedule B). There was also the possibility of the Tatas extending their support further if they were equally satisfied with me. Mr Walters also gave me the good news that the 1912 Exhibition that I had got the previous year would continue this year also.

I have not mentioned much about the letters that Mrs Vesugar used to send me from time to time. The tone of her letters changed as I continued to do well at Cambridge. I discovered that she had developed a soft corner for me and had been very worried when I had my accident. She too was much relieved and pleased with my performance. On another count, which I have mentioned earlier, I again demonstrated to her delight (on the basis of my second year's expenditure) that an Indian student in Cambridge can manage to live on £ 500 per year.

On the Sunday before the results were declared, our doctor friends Arun Mahajani and Kishor Shrikhande had turned up and the latter gave Chitre and me a feast to celebrate his getting the FRCS in first attempt, a really creditable achievement. Arun Mahajani invited us to St Albans where he had been appointed Registrar of the main hospital. We went for a weekend and had the experience of staying in a hospital without being patients! After seeing the local landmarks like the St Albans Abbey (claiming to be the longest cathedral in the world) and the lake and the zoo, we also had a ride in a Rolls Royce, which was actually used as the local taxi! In addition Dr Mahajani let us watch an emergency surgical operation too.

After my return to Cambridge I found an invitation to visit Denmark awaiting me. It had been forwarded by Mr S.G. Sathaye of the India House Education Department with whom I had maintained contact since joining Cambridge. There was to be a three-week international seminar in Aarhus on prejudice and discrimination organized by the World Veterans Federation and the UNESCO. Students from different countries were to participate along with some distinguished personalities as resource persons. My name as a student participant was being proposed by India House and Mr Sathaye had written asking whether I would like to go for the meeting. Although the subject was not from

my own field of expertise or study, I expected the discussions to be interesting and so I conveyed my consent. An added attraction, of course, was the opportunity of seeing another European country with all expenses paid. When I informed of this to Mrs Vesugar, her response was somewhat mixed. She cautioned me that I should stay clear of any 'red' or 'pink' organizations. This remark reflected her right wing prejudice against any socialist or communist organization.

My leg finally came out of all protective covers, which had started with a full-length plaster and ended with a thick bandage. I wanted to celebrate the event and could think of nothing better than inviting the Rev. Peter Schneider and Mrs Schneider to lunch at the local excellent restaurant in the Garden House Hotel. So on July 2, I had my first experience of playing host in a formal surrounding. Peter of course guided me on how to order drinks then food followed by dessert. We had coffee afterwards on the riverside as it was a balmy day. It was one of those pleasant occasions whose memory I will ever cherish.

Although I had paid several visits to London and seen some landmarks of the historic city, I felt that only a British Council guided visit would do justice to that city. So I had applied for the British Council Summer Vacation Course to London. We were given a really good tour of London over the week in July. The Tower of London, Hampton Court, Windsor Castle, Eton College, the Westminster Abbey, the Houses of Parliament were all shown with excellent briefing of their historical background and present activities. We saw a ballet in the Royal Festival Hall and an open air performance of the Midsummer Night's Dream in the Regents Park. Indeed, it was well worth the experience.

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I now embarked on my second and quite extended European tour, the first part being Aarhus, Denmark and the second, Rome, Italy. The latter was arranged by me in response to the invitation from Charat and Yashoda Dilwali who were in Rome and who were keen to have me there. As I mentioned earlier Charat had been a student of my father and was now holding a senior position in the scientific wing of the United Nations. His normal place of residence was New York City but now he was on deputation to the Food and Agricultural Organization in Rome. I had arranged to travel by train from Denmark to Italy; not only because of economic reasons, but also because train travel has always fascinated me and was my default option for the entire trip. (Except, of course, short stretches where I crossed the sea between England and the continent and the sea between Denmark and Germany.)

The trip from Cambridge to Aarhus accordingly involved train from Cambridge to Harwich, then boat-ride for six hours to Hook of Holland, then train from there to Hamburg, again boat from a station north-east of Hamburg to Copenhagen via Gedser, followed by boat from Copenhagen to Aarhus. I had the unique experience of seeing the train being carried on boat upto Gedser, where it was replaced on ground. We were asked to report to the Reception Centre at 4 May College in Copenhagen where we were provided with coupons for travel to Aarhus and for our lodging and boarding in the university there. All reporting students were treated to a sumptuous lunch after which I was met by my local host a Mr Pedersen, in whose house I was to spend the night in Copenhagen. Mr Pedersen was a charming and informal person who took me round Copenhagen showing me some landmarks like the statue of the Mermaid (immortalized by the Hans Christian Andersen story) on the sea shore, the Royal Palace and the deer park, etc. After a round of some 50 km in his car Mr Pedersen brought me to his home in Virum in the north of Copenhagen. Mrs Pedersen had specially made “curry” in my honour, in the Danish way, of course! After dinner the Pedersens took me to another of Copenhagen attractions, especially at night, viz. The Tivoli garden. Inside was a festive atmosphere, with superbly lit fountains and fireworks as well as an orchestra. The next morning Mr Pedersen brought me to the quay where the boat for Aarhus was waiting. It was a memorable time for me at Copenhagen, thanks to the Pedersens. The boat took seven hours to Aarhus which is located in the part of Denmark that is connected to the mainland. While leaving Copenhagen I could see Hamlet’s castle (of Shakespearean fame) from the boat. The crossing itself was delightful not the least because of the sumptuous meals we were treated to. I found that there were a number of us bound for the seminar on that boat.

I arrived in Aarhus at 6.30 p.m. and found that a number of taxis were waiting for us with cards of different colours. We too had been given different coloured cards and had been briefed to take the taxi with the matching colour code. This was an excellent arrangement as these taxis were to take us to specific destinations. I with the yellow card was headed for the Journalist College where my accommodation was arranged. We were given some time to freshen up before coming to the reception arranged to mark the beginning of the seminar. Various local dignitaries and ambassadors were present at the party which was addressed by the Lord Mayor of Aarhus welcoming us to the city. The Danish Prime Minister had sent a representative to welcome us to the country.

The seminar itself began in right earnest on the following day. Its purpose was to involve us, the youth of the world, into discussions and lectures on the existing situation in the world which, in many countries, was far from ideal so far as equality and human relations were concerned. Thus discrimination in various forms persisted and the question was, how to reduce such episodes of unequal treatment of people in order to achieve the ideal of equality. The daily pattern was lectures in the morning and group discussions in the afternoon. Lecturers included distinguished persons in various fields, authors, social scientists, diplomats, political leaders and other academics. I recall the very fine talk given by Mr Braithwaite, a West Indian, who had written a best seller called *To Sir with Love!*, that was later made into a movie with the same name. The book described the author's personal experience as a school teacher in a rowdy school of teenagers in the East End of London. Although he had to face a lot of bric-bats and racial comments from students for being a Black, he eventually won them over. In the lecture he drew upon his experiences, highlighting that it was more native ignorance about those coming from different culture, that initially leads to friction. His own experience showed that patience and tolerance are called for in smoothening relationships.

I must confess that I did not make much contribution in the afternoon group discussions. There were others, especially a couple of boys, who dominated the discussion coming always with some argument or other. Realizing my shyness and of a few other participants, the group leader (an Englishman) specially drew me into some discussions, asking what I felt about the issue. On one occasion he asked both me and a Pakistani student, what we felt about the massacres that took place at the time of partition of India. Sensing that he was trying to see if we two would accuse each other's countries while he watched the fun from sidelines, I replied that the massacres could probably been avoided if the British had maintained law and order in the closing stages of the Raj. My Pakistani colleague agreed and the Englishman was silenced.

I presume some written proceedings of all that was said and discussed eventually emerged, but I did not get to see it. Perhaps the exercise of involving the youth did pay off. Certainly some of the youth did get involved in social work that had a bearing on reducing racial and other tensions amongst different communities. I developed informal contacts with some students, including an Italian called Mario Tito from Rome. When he learnt that I was to visit Rome, he cordially invited me to contact him when I was there. He promised to show me the ancient city as a native inhabitant!

The students were treated to lavish Danish hospitality throughout our

stay. We were taken on tours of Aarhus and the Jutland, the part of Denmark around Aarhus. We saw a lot of Danish food, folk traditions, museums etc., apart from different scenic spots. I encountered the famous open sandwich the ‘smorgasbord’, with different toppings, for the first time. We had a variety of them at tea time. So except for my guilty feeling that I was not contributing to the meeting as much as I wanted to, I enjoyed my stay in Denmark. Although I was a passive participant, I suspect, the lectures and discussions did widen my horizons in a subtle way that helped shape my attitudes to the various social inequalities.

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The second half of my European tour was to be spent in Rome. I had booked in the Alpen Express, which took me direct from Copenhagen to Rome, going through Germany and Austria into Italy. At the conclusion of the seminar, I took a boat to Copenhagen. Unlike the day trip on the way to Aarhus, this was a night steamer and took me to Copenhagen in time for the departure of the train. I had (mistakenly) assumed that I only had a seat in this steamer and so had to sleep it out on a bench. Only towards the end of my voyage, did one of my fellow students on the steamer asked how much had I paid for my ticket and when I replied, he said that at that rate I should be entitled to a cabin berth. This turned out to be a fact when he examined my ticket. By then of course it was too late, as my cabin berth had been given to some waitlisted passenger. Because of language difficulty, I presumably missed any announcement of my name before the unclaimed berth was given to someone else.

The Alpen Express started on time and I enjoyed the 36-hour journey to Rome. We passed through the German flat land through Nuremberg and Munich before reaching Innsbruck in Austria. By then the hills and mountains were showing up and I sat glued to my window, enjoying the Alps, the mountain ranges, the tunnels and bridges and the occasional snow peaks of the Dolomites. By the evening of the second day we reached the famous Italian city of Florence. And three and half hours later the train rolled into the historic city of Rome. By then it was 11.40 p.m. but there was considerable activity in the Roma Termini.

I was relieved to see Yashoda Dilwali waiting for me at the entrance to the main concourse. We went outside to find Charat Dilwali waiting in the car with the engine running. He could not park and so was circling round and

round and we had found him on one of his passages. We came home and I was happy to have a cup of real Indian tea and some fruit. I had never before seen a peach as large and juicy as the one Yashoda cut up for me. Although I had not eaten much on the train the fruits filled me up soon enough.

Rome held two attractions for me. So far as sightseeing was concerned, there were all the historic landmarks like the Coliseum, the Forum, St Peter's, Nero's fiddling tower, the pyramid, the catacombs, and of course the various picturesque fountains. The Vatican Art Gallery took several hours to see. The other attraction was the variety of vegetarian food that Yashodaji was cooking for me. Having stayed away from home for nearly two years, I was really enjoying home cooked food as well as my stay with the affectionate Dilwalis. I got to taste the Italian food too, and especially liked the pizza. There was a pizzaria that the Dilwalis liked to patronize near the pyramid. I got to know another Indian family in Rome. Dr P.V. Sukhatme, a mathematician friend of my father was also at the FAO and he and his family entertained me often. I got to eat Maharashtrian food in their house.

The Diwalis took me to see other scenic spots near Rome, the Rocca di Papa, the hill where the Pope had his summer home, the Pinietta, which was a beach resort developed by Benito Mussolini, the Tivoli garden (quite different from the Danish version), and also a drive in movie. I had never been to a drive in movie before. The film was appropriately named : *Comme Prima*, meaning "For the first time".

Although I had been shown all the important landmarks of Rome by the Dilwalis, another experience was in store for me. I recalled that Matio Tito had asked me to contact him and so I rang him up. He said, he would come and take me on a sightseeing tour of Rome on the back of his lambretta, *at midnight*. At first the Dilwalis hesitated but agreed to let me go when they saw that Mario was quite 'respectable'. So off we went on a whirlwind tour of Rome at midnight. The weather was balmy and I thoroughly enjoyed the unique experience. At one place in a crowded market, Mario bought a small glass mug and had my name *Jayant* inscribed on it before presenting it to me. I have still kept it intact! He also showed me a spot in the front court of the St Peter's Basilica, from where all four pillars of the circular cloisters in different directions are seen exactly radially so that one sees only one pillar in each direction.

There were other Indian families in the building where the Dilwalis had their apartment. The Joshis and Dhitals we saw quite often. There was one memorable afternoon when we had an informal visit from the famous singer

Hemant Kumar. He gave a recital of some of his well known film songs especially from *Anarkali* and *Nagin*.

At Charat's suggestion I took a long one day coach tour of Naples, Pompeii and Sorrento. Our coach started early in the morning and went along the via Appia Antica, the old Appian Way down to Naples. Then we visited the ancient city of Pompeii now preserved as a museum place and the volcano Vesuvius. The lava from this volcano had destroyed the flourishing city of Pompeii around (79 AD). I was back in Rome around midnight after a very hectic day of sightseeing.

All good things finally come to an end and very reluctantly, I packed my bags back for Cambridge when my three weeks at the Dilwalis were over. They saw me off at the train leaving for Paris at 11.45 a.m. and the journey took nearly 21 hours. At Gare du Nord I took the train to London via Dover. I finally reached Cambridge in the evening around 10.45 p.m., after some 14 hours of journey time allowing for the time difference between the UK and the Continent.

The long continental holiday had been very refreshing and instructive. I was also relieved that nowhere on the trip did I have any problem with my left leg. Thus time was at hand now for launching the offensive on Part III of the Tripos.

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So in the beginning of October I began my third and final academic year as an undergraduate. One surprise I had was when Mr Williams called me and asked me if I would supervise two undergraduates for Part II! These were the same undergraduates who had been with me in Part I when we all used to see Dr Lyttleton. While I had taken the fast track and cleared Part II in two years, they had proceeded on normal track and were to complete Part II this year. However, being asked to supervise while still an undergraduate was exceptional, to say the least. Mr Williams assured me that this was quite OK and he was confident that I would be able to handle this responsibility well. Apart from being paid for this work (it was the sum of £ 10.8s per term, a princely sum so far as I was concerned) I would also be invited to have one meal a week on the High Table. While still not quite confident of my being able to do this job well, I accepted the offer as an indication of the confidence the College had in me.

My former fellow-undergraduates were amused by this arrangement and

were quite cooperative. They had seen my performance in the exams and so were confident that I would be able to handle their problems. At the same time they were slightly embarrassed (as I was too) at this change in our relationship. Anyway, we got along well and I personally gained tutorial experience which was to stand me in good stead in the coming years.

My courses at this time were mainly related to particle physics and astrophysics as one had to choose between a lot of possibilities. I had already been lured to astronomy by Fred Hoyle's *Frontiers of Astronomy* which had shown me how physics can explain many of the mysteries of the sky. Hoyle was lecturing on General Relativity and later on Cosmology. Dirac's classic course on quantum mechanics was an attraction, of course. Scott on nuclear theory was a bore, as all of us students agreed. Nor did we have much to say for Powell on statistical mechanics. Lyttleton lectured on stellar structure, Mestel on cosmical electrodynamics, Buneman on plasma physics, Shirkell on magnetohydrodynamics, Polkinghorne on quantum field theory...these were courses of interest to me.

I continued my policy of seeing the UK through the British Council courses and chose to go to the Isle of Wight that Christmas vacation. Before that I had the usual visit to London for the Tata Tea Party. It was a pleasure to meet the old hands and make acquaintance of new ones. Several scholars asked me how I managed to live a full undergraduate's life in Cambridge for under £ 500. One thing I remember from my Isle of Wight trip was the view of a hill covered with vegetation which the guide stressed had 120 different shades of green.

While preparing for Part III, I was also trying to plan for my future years at Cambridge as a Ph.D. student. I did not expect that the Tatas would come forward with additional commitment for another three years. In any case, I did not wish to increase my loan burden. The Isaac Newton Studentship meant for supporting research in astronomy seemed to fill the bill. Applications for this were invited by the end of March. However, my enquiries followed by those of my Tutor, Mr Walters led us to believe that preference is given to students who have already done about a year's research and so we decided that I should wait for a year before applying.

One of my much awaited visitors was Rajan Devadas, who had earlier been the PA to my father when he was Pro-Vice Chancellor at the BHU. My brother and I had known him well at the time. He had subsequently left for the USA on some scholarship and was now a free lance photographer in that country. He turned up unannounced one afternoon while I was lunching in

College. With his usual polite "Jayantji, please do not hurry, I am waiting outside" he waited as I hurried through my meal. We had a nice time together and he, of course, took a large number of photographs. Photography had been his hobby in BHU but now he was on his way to becoming a professional of repute. His house was to be my regular port of call in my later visits to the United States.

I was pleasantly surprised when Captain Thomson from the Tata Limited sent me a copy of a letter from Mrs Vesugar informing that the Trustees of the J.N. Tata Endowment had decided to extend a scholarship to me of £ 150 per year if I did well at Part III and continued research for a Ph.D. at Cambridge. I wrote thanking Captain Thomson as well as Mrs Vesugar. I later learnt that they had agreed to this unusual step because of the good word put in by my Tutor. So I thanked Mr Walters also.

In my letter of February 7, 1960, I write home recalling that it was almost a year since 'my world line intersected that of a lambretta' and that now I was totally fit and recovered from the accident. I decided to go to Bangor on the British Council Vacation Course for Easter. This would take me to North Wales and this was the course I had planned to take before I had the accident. In the last week of February I attended a Union debate on the motion: "This House does not consider that a belief in a personal God is conducive to good life". Mr Walsh, the Vice President of the Buddhist Society spoke for the motion and the Abbot of Downside spoke against it. The attendance was quite big and the motion was defeated.

The trip to Bangor was most enjoyable. We could see the more hilly portion of Wales as well as catch glimpses of the Atlantic. We were taken to the Carnervon Castle where the ceremony of 'coronating' the Prince of Wales takes place. We also saw the Conway Castle which is in a small town on river Conway. There is here a local exhibition of the characters from *Alice in Wonderland* since the famous book was written here. We could also travel through the hilly Snowdonia and enjoy the scenery for which North Wales is so famous. The more ambitious attempt to climb Mt Snowdon had to be abandoned because of heavy rain. We returned home after getting drenched while climbing only about 500 feet!

In March I received a thunderbolt from Mrs Vesugar! I had written to her expressing my desire to pay a visit to India for a couple of months in the summer after I had received my degree. She wrote back stating in no uncertain terms that she did not approve of it. She felt that it would be a waste of time and money; that she would discourage it even if the passage was not paid by

the Tatas. I was quite disheartened by this missive as I was looking forward to seeing my family after a lapse of three years. I urged my father to speak to Mrs V to make her change her mind. I think his intervention worked and she agreed to my visiting India from early July to early September. So my mood improved!

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Meanwhile the countdown to Part III had begun and I practiced for it by attempting questions from preceding years and also timing myself to do three questions in a three hour period. I was reasonably confident that I would be able to do a typical Part III paper in three hours. Unlike Part II, the question was expected to require an essay-type answer and the stress was more on the exhaustiveness of the write-up. However, in early May all Part III students were informed by the Chairman of Examiners that the job of fitting questions into six papers so that each student could answer three from his chosen field had proved to be an ‘insoluble jigsaw puzzle’. The circular gave the distribution of questions in each paper so that those students who could not get enough questions in any paper should still (at this late stage) think of opting for other fields. I was relieved to find that in my case the distribution was fair and I had three questions in each paper from my chosen six subjects. In addition I had prepared for a few more subjects just in case I found the questions from a chosen field too tough.

The exams were to begin on the ‘Monday after the first Sunday in June’ that is, on June 6, in the Examinations School premises, where I had sat for my prelims two years earlier. In the exams there were no unpleasant surprises and I could do three questions from plasma physics, functions of mathematical physics, cosmical electrodynamics, two from cosmology, general relativity, quantum theory, stellar structure and one from special relativity. There were 19 questions set on these subjects: so I had dropped one from quantum theory. I anxiously awaited the results on June 16 (Thursday after the second Sunday in June) when the results would be announced from the inside balcony of the Senate House. I knew the wait would be longer as we had to wait till the Part II results were read out first.

The anxious wait at the reading of the results was not so much about my performance in the Tripos. I was confident of getting a ‘star’, which meant a distinction, but additionally I was hoping that I would win the Tyson Medal for astronomy which my father had got in 1930. The statistics were grim: the

medal had not been awarded for the previous three or four years and no Indian had won it since my father. There was another prize, the Meyhew Prize for applied mathematics other than astronomy; but I did not bid for it as my offered subjects were more in astronomy.

In the end my hopes were realized and I heard the Chairman of the Examiners, Dr Todd, pronounce "Tyson Medal awarded to Narlikar, J.V., Fitzwilliam". I got a distinction as did Kumar Chitre and Jamal Islam. The Meyhew Prize went to a student called Taylor from Clare College who went on to work in particle physics. I later learnt that his father also had won the same prize in his time! When I went to the Post Office to send my cable my friend behind the counter again congratulated me on reading the message sent: "Star, Tyson Medal".

We went to the Arts School later where we were briefed about seeing our prospective research supervisors. Dr Batchelor who conducted the meeting told me that I was to meet Professor Hoyle the next morning at 10 a.m. at his house. So my research career was about to begin.

## EMBARKING ON RESEARCH

THINGS moved fast after the announcement of the Tripos results. The successful students were asked to contact their prospective supervisors for research. I was informed that Professor Hoyle would see me on Friday (that is, the day after the announcement of results) at 10 a.m., at his residence at 1 Clarkson Close. George Batchelor, who was conducting this briefing session told me that the short cul de sac of Clarkson Close branched off to the left off Clarkson Road after one turned into it from Grange Road at the back of St John's playing fields. By way of further help in identifying the place he told me to look out for a modern house with unusual architecture at the turn off into Clarkson Close. Professor Hoyle's house, although modern, he mentioned was not as interesting to look at.

Some days, even if in the distant past, remain graven on one's memory board, while others are forgotten. Friday, June 17 was of the former type. I recall it as one of those balmy and sunny June days when the British summer is at its best. I walked across the river on the Garret Hostel Bridge into the backs, then continued down the leafy lane past the University Library on to Grange Road, turned right and went down till I spotted the turning to Clarkson Road. There was a strange box-shaped house with the box supported one floor up on a pillar: unusual architecture indeed, to guide me onto Clarkson Close. I was to make my way down this way for innumerable number of times during my stay in Cambridge; but somehow that first visit to Fred Hoyle's house stands up very distinctly in my memory.

As Batchelor had mentioned, 1 Clarkson Close was a modern looking house compared to all the standard detached English houses. It was not very big but it stood in a spacious plot with a garden of flowering plants and a longish lawn. I rang the bell and with a yapping dog-bark in the background the door was opened by Fred Hoyle himself. He welcomed me with a big grin and an outstretched hand, and congratulated me on my performance. Mrs Hoyle also came out and asked me what I would like to have for a drink. Since I did not take alcohol, Fred suggested iced lemonade which was very welcome in the heat that was slowly building up.

"Let us sit out in the open", said Fred and we moved a couple of deck chairs outside. I selected the chair in shade while Fred sat in the sun. The yapping from a black poodle had stopped as Fred told the dog, Sam, 'to beat it'. As we sipped iced lemonade in the sun, I could not but think, how un-English it all was...lemonade in the sun, sitting outside an un-English looking house and talking with a person dressed in open shirt and trousers who had a very un-English informality.

Fred straightaway came to the point: "I can suggest for your consideration a number of problems to choose from" he said, listing them as (1) World models in cosmology (2) Gravitational waves (3) Interior Schwarzschild solution with a realistic equation of state (4) Electron spectrum in radio sources and (5) Stellar evolution using computers. He briefly detailed them for my benefit and stated that I could think over and see him again in a day or two. The world models he described had a spinning universe, first considered by two Germans Heckmann and Schücking. I will return to this topic shortly. However, I found that he did not mention his own model, the steady state theory which I had liked very much and wanted to work on. I mentioned this to him and after a pause he replied: "Yes, there are things to do there, but I am of the opinion that a new research student should not work on a controversial topic." I was disappointed, although I could sympathize with his 'protective' point of view. Today, recalling that remark makes me very amused indeed.

Fred asked me about my financial situation, whether I needed a scholarship. I said that my resources were limited and mentioned the Tata grant that had been promised. Fred then promised to see if the university could come forward with any grant. He said that a new college called Churchill College (about which there was much discussion in the university circles) was shortly to be set up and there might be some grants there. But he felt that since Fitzwilliam had been very kind to me, I should try to continue there. Although

in Cambridge people do change college on some occasions...Hoyle had himself moved from Emmanuel to St Johns..., this was usually done at the time when one became a fellow. We left it at that and I had the comforting feeling that somehow my financial problem would be solved.

As I left, Barbara Hoyle (as I soon learnt to address her as) had a small chat asking me about my family back in Banaras, my parents and my younger brother. I found her very sociable and welcoming. She mentioned that they had two children, Geoffrey and Elizabeth, both of whom were at school. It was 11 a.m. as I left the Hoyle home and as I walked out of the gate I encountered John Faulkner a fellow student who had cleared Part III with a distinction, walking in. His was the next appointment with Fred Hoyle.

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Unlike the once-a year convocations at most universities, certainly in India, Cambridge has its 'congregations' at least thrice a term. However, in June there is the general congregation when most graduands get their B.A. degrees. The degree of Bachelor of Arts is awarded to those who clear the requisite number of Tripos examinations in any subject, or group of subjects, whether in the sciences or engineering or humanities. The degrees are awarded to graduands of colleges in a certain order. First come the royal foundations, that is colleges founded by the royalty in England. In order of seniority of age this means that the graduands of King's College are awarded degrees first, followed by those of Trinity and then those of St Johns. Then the rest of the colleges follow in order of seniority, starting with Peterhouse, the first to be founded (in 1286). The ceremony which I will describe below takes a fair amount of time and lasted in those days for two whole days. The degree is awarded by the Vice-Chancellor and since one person cannot go through the exercise all through this period, other senior faculty members (usually masters of colleges) deputised for the VC on this occasion.

At Fitzwilliam the graduands like me who were to receive our degrees were treated to a Degree Day Dinner by the College. It was a feast with many courses and quite different from the regular undergraduate dinner in hall. I had the honour to sit next to the Censor Dr Grave. Dr Grave had been very friendly to me right from the day he had joined Fitzwilliam. He expressed his concern that my younger brother should not be deprived of a Cambridge education. He suggested initiating steps for Anant's admission as a research student. Since he had already completed his M.Sc. in B.H.U., and was doing

research there, Dr Grave felt that he may not need to appear in any screening test like a tripos examination before admission.

The following afternoon (June 25) at 4.45 p.m., we were scheduled to be presented to the VC for the degree. Ten minutes prior to the scheduled time all of us were at the Senate House in a procession dressed in the full regalia of a dark suit (ideally a dinner jacket), white shirt, white tie, gown and hood and bands. As the ceremony started we were presented in groups of four to the VC (each holding one finger of the Praelector). The graduand knelt before the VC who held his palms joined in the Indian 'Namaste' fashion between his palms and uttered a Latin invocation. The graduand then got up, bowed and left his presence. As he left the Senate Hall he was handed the degree certificate by a university official.

It is a long drawn out procedure, certainly for the VC and those deputizing for him. But it is carried out with dignity and decorum watched by parents and relatives of the graduands from the inside balcony. As their graduand leaves the Senate Hall, the visitors also descend the steps quietly and exit by another door. Weather permitting there are photographs taken on the lawn outside. I had a couple of photographs taken on the occasion by the professional photographer who was in attendance outside. In case one needed a studio photograph, his studio was not far away.

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I was booked to leave for India on July 2 and accordingly I was trying to wind up my stay at 200 Mill Road. Although the landlady and her family were very friendly, and would have been happy for me to continue my stay there, I was now feeling that I should change to some digs closer to the town. With the help of a few Indian friends I found a lodging close to the town centre and fixed with the landlady, Mrs Richardson, to stay there from the time I returned to Cambridge from India on September 6. I even arranged to leave my extra baggage, that I did not need for my Indian trip, with her.

While I was putting finishing touches to these arrangements, I also made a few short trips outside Cambridge. One was to Oxford, with Chitre which was a day trip. 'The other place' did not impress us and we felt that Cambridge was much better. For a start, industry was making its presence felt in Oxford which as a result appeared a busy city, compared to the informal town that Cambridge was. I could appreciate the statement that 'Oxford is a university in town whereas Cambridge is a town in a university'. Cambridge has the

backs which provide a panorama of colleges against the river Cam and the plantations of majestic elms. In Oxford, each College has its own parkland tucked inside its forbidding boundary walls and so one does not get a comparable panoramic view. Nor does the Isis present a unifying theme as Cam. However, I am the first to admit to an Oxonian that I may be slightly prejudiced!

Then we had a visit to Huntingdon, to the County Hospital there. Again, not because I was sick! I and Kumar Chitre were invited by Dr Arun Mahajani who had now changed jobs and moved to Huntingdon. We had an amusing experience to relate to him. As we descended from the bus from Cambridge after the 16-mile journey to this small village-like town, we were looking for directions to go to the hospital. We encountered a policeman and asked him the way to the hospital. He gave us instructions and then asked “Were we visiting Dr Mahajani?” In a small place like Huntingdon, where everyone knows everybody else, this was perhaps not surprising. However, we felt that this was another demonstration of the outgoing and friendly personality of Arunsaheb. We narrated the incident to him telling that “Beware! your name is known to the police.”

After enjoying his warm hospital hospitality over the weekend, we returned to Cambridge by the evening bus on Sunday, 26 June.

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Fitzwilliam gave me a special prize of £ 25, which was a pleasant surprise. They also renewed my 1912 Exhibition of £40. I still awaited decision of any grant from Cambridge University which would be known while I was in India. My eyes were now on July 3, the date I would land in Bombay and see my family after nearly three years. The Tatas had booked my passage on the Air India flight leaving in the morning of July 2 and landing early morning the next day at Bombay. The aircraft was to be Boeing 707, the first of the long distance jets to be used by Air India. Today one flies non-stop London to Bombay in Boeing 747; but those days a flight with 2-3 stops was considered fast. Captain Thomson had sent me details on how and where to check in. In contrast to the almost unlimited baggage permitted on boat, here I was to travel with no more than a total weight of 44lb (20 kg), *including hand baggage*.

This was not difficult so far as my personal effects were concerned. I did not need to take any heavy winter clothes; nor did I have to worry about clothes to be worn in India as my clothes in Banaras would be still there. I had

put on some weight but was confident that those old Banaras clothes would fit me all right. My main problem was how to accommodate gift items for various family members within this stringent limit.

Before leaving I was due to see Fred Hoyle for any advice regarding vacation reading. I called on him again at his house and had a long chat on future strategy. He asked me when I would be returning from India. I told him, on September 6. He thought for a while before saying : "That would be OK, but please do contact me as soon as you reach Cambridge as I may be leaving for the United States around that time". Hoyle at the time had a part time appointment at Caltech for the fall (autumn) semester and would be away from Cambridge during my first term as a research student there.

He gave me some reprints to look at. These included the paper by Heckmann and Schücking, his paper with Gold on cosmology, both papers presented at the Solye Conference and the thick paper on making elements in the stars by four authors, Margaret and Geoffrey Burbidge, William Fowler and Fred Hoyle. Later I was to appreciate that this was the classic paper often referred to as the B<sup>2</sup>FH. He wanted me to use some of these ideas in the model proposed by Heckmann and Schücking. On my scholarship, he said that he hoped that the university would do something.

It was with this state of affairs that I made my way to London. I stayed in the Indian Students' YMCA in Fitzroy Square, which was better maintained than the Indian Students' Hostel. I was to report with my baggage to the BOAC airlines terminal in Victoria early in the morning. So I had to miss my breakfast at the YMCA and had to be satisfied with a sandwich at the terminal. At the terminal I checked in my bags and took the bus to the airport when it was announced. The airport was still mostly a makeshift one and so checking in at the Victoria terminal was encouraged. The flight left in mid morning. We were fed lunch at Geneva airport as the system of giving lunch in the aircraft had probably still not been perfected. After another stop in the Middle East, the plane headed for Bombay and for me it did not go fast enough. When it landed at Santa Cruz, I was all set to jump out!

I had arrived after three years, with a string of successes behind me. I now looked forward to meeting my parents and Anant.

## THE RETURN OF THE NATIVE

**A**S the plane taxied to the terminal in its slow and stop-go fashion, my impatience grew. When were we the passengers to be ‘released’ from the tyranny of seat belts? That moment arrived eventually and as I finally stepped out on to the stairway, a blast of warm humid air hit me. This was the typical humid day in Bombay in July, when the Monsoon was expected to be in full swing. Fortunately it was not raining, although the wet tarmac showed ample evidence that rain was not far away. This was the Indian heat that I had almost forgotten and it reminded me that the heat of a tropical day even in early morning was in an altogether different class to what a British summer at its hottest could provide. This was home and that feeling brought warmth and expectations. I expected my parents and Anant to be out there waiting, with possibly a few relations.

This was the Santa Cruz airport where I was landing for the first time in my life, indeed the plane travel I had undertaken to come here was the first ever in my life. I had enjoyed the experience, although I still recalled with nostalgia the spacious and luxurious setting of the *S.S. Strathnaver*. The immigration and customs took long as the queues were long and the customs officers opened all bags. However, it was over within the hour after landing and I came out bag in hand to the large crowd of people waiting for the passengers.

Dadamama and Ranjanimami were the first to greet me, the latter putting a sweet burfi in my mouth. Then I saw my parents and Anant. Feelings of joy,

relief and impatience for talking to them alone crowded in my mind. But I had to wait until the many others, relations and friends who had come in the middle of night had their chance of greeting me. After meeting and chatting with them, after they left for their homes, I was finally alone with my parents in a car as we made our way to the Puraniks' residence in Girgaon. The road was narrow, not today's expressway with flyovers; but the morning traffic had not yet built up and so we reached our destination within an hour. I could not help but compare the roads in Bombay to those in London, finding the former small and not so well-maintained. When one goes from a smaller to a bigger environment, one does not feel the difference so much as in the reverse situation. Was this the same Bombay, I nevertheless wondered, which had struck me as being such a big city whenever I had visited it from Banaras?

I hardly had sleep during the cramped air journey; moreover, I had travelled early morning from London and so had had only a fitful sleep the previous night. Now the jetlag was catching up and after a refreshing bath my parents insisted that I had a nap to help me catch up on the arrears. The Puraniks were as hospitable as ever and happily entertained the stream of people who dropped in to meet me and talk to me after my three years stay in Cambridge.

My father then briefed me as to how my nine weeks or so in India were planned. We would all be in Mumbai for a few days to meet friends and relatives. I would naturally call on Mrs Vesugar and the J.N. Tata Endowment office. After Bombay, my parents and Anant would leave for Banaras while I would travel to Pune to be with Vasantmama and then go to Kolhapur to meet my uncles and aunts and cousins. After that I too would come to Banaras.

My father then disclosed that he had finally decided to leave B.H.U. after spending 28 years there. He had been invited to take up the Chairmanship of the Rajasthan Public Service Commission which was headquartered in Ajmer and that he felt that he should move there *while I was in India*. This way I would get to see him in his new habitat also. Accordingly, he had arranged to leave Banaras towards the end of July and take up the new assignment from August 1.

I had had an inkling of this proposed transition while I was in Cambridge but now that it was so close to happening, I was a little sad. After all I had come to look at Banaras as my home town and had considered it a certain fact that my father would retire there in 1968, or later if employment beyond the age of sixty was permitted in certain exceptional cases. Even though I might no longer have the occasion to stay in Banaras for an extended period, this loosening of ties with the *Alma Mater* brought pangs of sadness. I asked my father the

reasons for this decision. He advanced two reasons. Firstly, he felt that with a higher paid job and more perks, he would be able to set aside more money for my and my brother's higher education. Secondly, B.H.U. as he perceived it, no more possessed the enchanting academic environment that had attracted him in 1932. In fact, as he put it, after independence, the University experienced a phase transition in which far from being the place harbouring 'anti-national' characters as the British rulers saw it, it had acquired a prestigious place in the eyes of the new Government of India. The GOI in fact soon conferred on the B.H.U. the status of a central university. Thus gone were its days of penury with every paisa to be watched for. Instead the university began to receive handsome grants from the GOI in its new 'avatar' as a central university and that, paradoxically, proved to be its undoing. For, my father explained, in earlier hard times right from the days of Malaviyaji, the staff who had joined the B.H.U., had done so from a sense of commitment rather than to get a well paid job. This attitude was now changing as money was no longer the problem. Further, the independence of the country had been conveniently interpreted by many as a privilege to do what one liked and so the sense of discipline was disappearing from the university as it was from other public bodies. Cases of corruption amongst the staff, politicking amongst the academia, frequent strikes by the students had vitiated the academic ambience that the B.H.U. anthem had envisaged: *Madhur manohar ateева sundar, yeh sarva vidya kee rajadhani* [Delightful and pleasant, as well as extremely beautiful, this is indeed the capital for all knowledge.]

I cannot say which of the two reasons saddened me more, but in a sense they worked against each other. True, I was sorry that my father, though well known for administrative efficiency, really liked the academic roles of a teacher and researcher and it was a pity that he had to leave the latter for the former. But the sadness was alleviated somewhat by the facts of life that he was no longer deriving the same satisfaction from his present job because of the changing environment in the university.

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My next stop was, of course, with Vasantmama who now was happily remarried and so no longer lived the life of a bachelor. Prabhamami was a jolly person who played an excellent role in bringing into Vasantmama's world of books and papers, such mundane things like shopping, cinemas and restaurants. Indeed I was happy that Vasantmama had found a good mate.

Vasantmama, of course, would not let me go till I had given a seminar in his department. My father had told me that I should pay a courtesy call on the great Sir R.P. (Appasaheb) Paranjpye, Senior Wrangler of the 1899 vintage. So Vasantmama had a brilliant idea: to have the Senior Wrangler of 1899 preside over a seminar by a Wrangler of 1959, a gap of six decades separating us! Appasaheb obliged and I gave a seminar on ‘The Expanding Universe’ under his chairmanship in the Department of Mathematics. This was my first seminar, but I enjoyed giving it. Later Vasantmama had a special photo-session with me and Sir R.P. I have preserved those photographs.

From Pune, I went to Satara where I spent some time with the Phadnis family. Yashawantrao Phadnis was a cousin of my father and close to him from his early life. In Satara I had my first ‘public function’! The New English School, an old school with scholarly tradition had invited me to address the students in Marathi. This was indeed an ordeal since I had not spoken in public in Marathi and addressing school children is quite different from giving an academic seminar. The school had a distinguished ‘old boy’ I knew and greatly respected: Wrangler G.S. Mahajani, then a member of the Union Public Service Commission. There is a Sanskrit saying which runs like this: *Mahajano yena gatah sah panthah* (take the path that *Mahajans*, i.e., great men or a large body of men, have followed.) I improvised to say *Mahajani yena gatah sah panthah*. That is, for us new students to Cambridge the path to choose was one which Mahajani had taken. In my case, I was happy that I could realize that promise in 1962, as will be clear later. Anyway my short speech in Marathi based on the above improvisation, went down well.

My visit to Kolhapur was on a different level this time than all my previous visits had been. Earlier I had been a student finding my way in life. Now, although I was still a student, in the eyes of the public I had ‘arrived’. That is, I was now an established person with a Cambridge degree, and so people from my town of birth wanted to tell me in various ways how proud they were of my achievement. An added charm was that twenty eight years ago they had similarly felt proud of my father. As in the past, despite this change, I stayed in the Huzurbazar Wada and visited our ancestral home in Mahadwar Road on occasions. My uncle was very proud of me and recalled with great relish how my father (his young brother) had performed similarly at Cambridge. Various relatives and close friends came to meet me at both the Naralikar Bhavan at Mahadwar Road and at the Huzurbazar Wada. Here too I was honoured by two organizations: the Karavir Nagar-Vachan Mandir (the City Library) and the Karhade Brahman Sangh (the organization of Karhade Brahmins to whose

caste I belonged). Again I was in a quandry as to what I should say when replying to the speeches in my honour in both these places. Dadamama came here to my rescue. He drafted for me short speeches dotted with witticisms which I had come to associate with him. Dr Kaka had come to these functions too and I bid good bye to him after the second one as I was to leave Kolhapur soon. Little did I realize that that was to be my last meeting with him. Shortly afterwards he died of a massive heart attack.

Perhaps I should end the account of my Kolhapur trip with a description of my second encounter with the ‘palm reader’ who had prophesied in 1957 that I would not go abroad because some last minute problem would crop up. When I reminded him of his prophesy and told him how wrong it had been, he looked at my palm again and said that the lines on it had been well consistent with foreign travel and what he must have said was: “ You may have several problems which would appear to prevent your going abroad, but they will be resolved at the last minute.” In short he completely reversed his earlier statement.

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My return to Banaras was equally triumphant. I was accorded a welcome by the Department of Mathematics which also had a very moving ceremony to bid farewell to my father. All the staff members had known him either from the days he had joined (in the case of senior ones) or had been trained by him at some time or other during the last 28 years. In fact, as I had not realized then, the department was passing through a transitional phase when during the next few years the old guard would retire and make way for the next generation.

At home things were the same as when I had left, one new servant had replaced the old one. Very soon I had the eerie feeling that I had hopped across the three year period and was continuing my existence as before! Sometimes I felt that the Cambridge sojourn was but a dream.

The season was when the langda mango was disappearing from the scene (I had been too late to enjoy the alphonso in Maharashtra). The rains were in full swing although the Banaras rainfall (around 1000 mm during the season) was mild compared to Bombay. I called on several of my friends and my father’s friends, receiving their congratulations and good wishes for my Cambridge performance.

At home, though the impending changes were casting their shadows. My father was to leave for Ajmer at the end of July and so he had to wind up his work and complete his packing. We were to follow after a couple of weeks with the rest of our belongings. Fortunately the house itself was not going to be

vacated. Anant was to stay for a few months when he would be joined by Morumama who was due to return from Moscow and to resume his lectureship at B.H.U. Eventually they would move to another smaller quarter that the university would assign to Morumama. Anant was now embarked on a Ph.D. programme under the Head of the Physics Department, Professor Ajit Ram Verma. I was parallelly trying for a research studentship for him at Cambridge. Dr Grave at Fitzwilliam had already promised that he would be admitted to Fitzwilliam if he did not get a studentship from any college.

In the midst of all this there arrived a letter for me from the Board of Graduate Studies at Cambridge with the happy news that I had been elected W.A. Meek Scholar for the year and would get a stipend of £250. The Board also informed me that this stipend will be supplemented by a research maintenance grant. The Meak scholarship was totally unknown and unexpected to me; I later learnt that it was given to the student with the best performance in the scientific subjects of the Tripos and who was proceeding to do research. This was good news as it removed any uncertainty about my finances for doing research at Cambridge.

So my father left Banaras with at least relief on his mind that my finances were taken care of. I still visualize the crowd of colleagues and students as well as well-wishers who came to see him off at the Banaras Cantonment station. He was leaving for Delhi by the Upper India Express, I think. He would spend a few hours in Delhi the next day and then take the night mail to Ajmer. He would be met in Delhi by someone from the Rajasthan Public Service Commission's office in Ajmer, so that his transit in Delhi would be without hassle. In addition, he would spend some time with the Mahajanis in Delhi.

After he left, we began our winding up operation. Things that we needed to be kept and transferred to Ajmer in a truck, would be identified first. Next would come the second lot to follow when Morumama came and moved to another staff quarter. Some things would have to be abandoned or given away. On such occasions one realizes that there are several things that one gets attached to and wants to retain, because of past associations, whereas in reality they would no longer be needed. Tai, my mother, had a beautiful shloka to recommend a detached attitude, it said: "One should live in one's home as if one were a guest." Paradoxically, when it came to deciding what to take and what to leave it was she who wanted the most to retain the old memorabilia!

So at last I came to bid good bye to Banaras and to B.H.U. I had chosen the same train for Delhi that had taken my father earlier. Tai and Anant were also with me. For Tai also it was leaving a place she had looked upon as her home since 1937 when she came here as a new bride after her marriage. Anant, who had been so upset when in 1951 we had moved from this house to the Pro-Vice-Chancellor's residence, was calm but subdued. After staying for about three weeks in Ajmer, we two would go to Bombay via Ahmedabad. Then I would depart for the UK, while he would return here and await Morumama joining him from Moscow.

The evening train reached Delhi by mid-morning. My father had come over from Ajmer by the night train which we were to catch back in the evening. We were to spend a few hours with Dr Mahajani, to whose house in 9 Teen Murti Lane, we were taken by his car. After fresh up and lunch we were well rested. We had not been to Delhi before, but this was not an occasion for any extensive sightseeing. We did catch glimpses of a few important landmarks of the capital city before we again made our way to the railway station. On the Mail, we had the luxury of the whole of an airconditioned compartment for us. We were to reach Ajmer the following morning around eight o'clock.

However, a minor adventure was in store for us! We passed through Jaipur early next morning at the scheduled time but the train came to a halt shortly after and then moved slowly to a small station where it rested. The unscheduled stoppage for half an hour soon lengthened to an hour when we got the news that because of derailment on the track we have to await the line to clear. As this route had only a single track, there was nothing to do but wait. Fortunately we could get food on the train and our carriage was airconditioned. We were to wait for several hours and finally our train rolled into Ajmer station at around 5 p.m., some nine hours late.

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Till his assigned house was ready my father was staying in the Circuit House and thither we went from the railway station. Mr Kapur, the Secretary to my father had come to receive us at the station and he organized the transport. The Circuit House was located on the top of a hill with a marvellous view of the lake, Foysager (named after an Englishman Mr Foy, who had designed it as a water reservoir). Indeed we found Ajmer to be a much smaller town than Banaras with beautiful natural setting of hills and lakes. The holy lake Pushkar was around twenty kilometres away.

The Circuit House itself, though with luxurious rooms and service had primitive toilet facility. The oldfashioned commodes were used instead of flushing toilets. The switchover to the modern version took about an year, I think. Barring that, we had a very pleasant and restful time in Ajmer. Tai specially enjoyed it as she had no household duties to attend to. My father used to go to work from around 9 a.m. to about 5 p.m. with a lunch break in between when he would come home.

The public service commission was mainly concerned with appointments to the numerous positions supported by the State of Rajasthan whose capital was (and continues to be) Jaipur. The RPSC was the most important state organization in Rajasthan and my father was the seniormost official in the state hierarchy. In fact, by tradition and by practice, the RPSC was supposed to be free from any governmental interference. For, there were important jobs at stake and if one did not observe strict objectivity, phone calls from Jaipur from ministers could unduly influence the selection process. My father had a reputation for strict impartiality and he was able to preserve this objectivity and transparency in the selection process. His colleagues, the other members of the Commission were Mr Lakshmi Lal Joshi and Mr Shanbhag. The former had been a college principal and was a well read and cultured personality. Outside of his office hours he had intellectual interactions relating to Sanskrit texts and Indian philosophy with both my parents.

Although he had been provided with a staff car, my father was advised to purchase an ambassador car which, in those days of scarcity, was available to him from the government quota. Cars in India were scarce those days and had a long waiting list. However, my father could get a car relatively soon and with a better make up. The car being manufactured in Calcutta, had been promised by the beginning of September. He was hopeful that it would arrive before Anant and I left for Mumbai. We were due to leave after Tai's birthday on September 1.

We went round on long drives in the countryside almost every evening as my parents were fond of car rides. On some occasions we took ice cream cups from a local ice cream shop to eat on the way. We thus went to Pushkar, Shrinagar, the Jaipur Road, as well as along other roads leading out of Ajmer. Petrol was cheap those days and roads quite empty and so these car rides were very pleasant.

We celebrated Tai's birthday and were due to take the Ahmedabad Express that evening. Message had reached my father that the car allotted to him had left its factory in Calcutta a few days back and was expected to reach Ajmer

that day. Anant and I anxiously looked out for any ‘silver grey’ ambassador on the road towards the Circuit House, as we could get a good view of the road from the balcony. Alas! We waited in vain till our time of departure came and so we went to the railway station. I bid good bye to my parents here only as they were not expected to come to Bombay to see me off. I was conscious of a pang of sadness as I knew that it would take another three years before I saw them again.

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My return journey began in Ajmer. The train reached Ahmedabad the next morning and Professor P.C. Vaidya came to receive us. He had been a student of my father in the 1940s and was now the Head of the Department of Mathematics at Gujarat University. Anant and I were to spend the day with him and then go to the railway station to catch the Gujarat Mail in the evening.

We had a pleasant time in the Vaidya house and we enjoyed the home cooked Gujarati meals there. In the afternoon I visited the Physical Research Laboratory in Navrangpura, the institution set up by Vikram Sarabhai. Dr K.B. Shah from PRL took me there and showed the work being done there. I had met and known the Sarabhai brothers Anand and Suhrud in Cambridge, and through them had some correspondence with their uncle Vikram. Vikram Sarabhai had also been educated in Cambridge and had also worked under Homi Bhabha. He was interested in space and atmospheric sciences and through PRL was initiating India’s space programme just as Bhabha had initiated the atomic energy programme through the Tata Institute of Fundamental Research. This was to be the first of my many future visits to PRL.

We got an auto-rikshaw to the station and said our good bye to the hospitable Vaidyas. The Gujarat Mail was on time and brought us to Bombay. We got down at Dadar and went to the Agashes in Shivaji Park. We met the various friends in Bombay and then in the evening set off towards the airport around 9.30 p.m. As at the time of arrival, now too several friends and relations had come to bid me ‘bon voyage’. Those were the days when foreign travel was something of an adventure and relatively few people undertook it. Also, there were hardly any security restrictions until one crossed the immigration barrier. Prabhramami and Vasantmama were also there. Chitre and I had arranged to depart on September 5, exactly three years after our original departure for the UK in the S.S. Strathnaver. I met Chitre at the airport and we both bid good byes to those who had come to see us off and crossed the passport control and the customs.

The airport was housed in Santa Cruz and was a small affair compared to its present expanse. We were waiting in the open area just outside the departure building when a piece of toffee fell at my feet. It was of Rawalgaon make, the favourite of Prabhamami who always carried a few in her handbag. I looked up as another piece fell and saw her wave from the Visitor's Gallery, which was in an open area atop the departure building. It was her way of saying "Good Bye". Chitre and I took a piece each as we waved back at her.

After a wait for about half an hour our flight was called. Back to Cambridge and to a new adventure. Tripos had its own challenges in the form of tough examinations. Now we were venturing into the unknown territory of research.

## RESEARCH AND CONTROVERSY

My research guide, Fred Hoyle had told me prior to my departure for India, that he would be leaving for the United States in the second week of September and so, if I managed to return before that date we would be able to have a discussion on how I would manage without him for a whole term. For, Fred was to spend a semester at Caltech as a visiting associate, an arrangement which enabled him to keep up his collaboration with Willy Fowler, a nuclear astrophysicist at Caltech. Certainly it was very necessary for me to have such a discussion and so I had scheduled to leave for the UK on September 5.

The Air India International flight brought Kumar Chitre and me to Heathrow on time and we took the bus to the BOAC Air Terminal in Victoria. Taking a taxi to King's Cross, we managed to get on to the 1.05 p.m. train. Unlike the train we had taken for our first ever trip to Cambridge, this was a fast one and we reached Cambridge within an hour and a half. I was anxious to get in touch with Fred, fearing that I might be too late already!

I recall calling his house at 1 Clarkson Close in early afternoon. Mrs Clarke came on the line. Yes, she said, Fred was expecting me to call but he had gone out for some meetings and would not be available till late in the evening. And he was scheduled to leave for London Airport the next morning for his flight to the USA. Given these constraints, she suggested that Chitre and I could meet him in his rooms in St John's College where he was to have dinner with a friend Leo Smit whom we could see him at 10 p.m.!

So with some trepidation we barged into his room at St John's at that

unusual hour. Fred had concluded his meal with Leo, a musician, and they were enjoying after dinner liqueur. He brushed aside our apologies for this interruption and came straight to the point. To Kumar he advised that he should work with Leon Mestel as his supervisor. To me he suggested visiting London, the relativity group of Felix Pirani for the term. He was expected back in Cambridge by the end of November and so a few weekly visits to Pirani at King's College, London would help enlarge my theoretical foundations in general relativity. He said that he would write a letter to Pirani that night itself.

So Chitre and I left him at 10.30 p.m. reassured on what we were to do. For Chitre the arrangement was permanent, in the sense that he was to work for his Ph.D. under Mestel. For me it was for the duration that Fred was away and I waited for Pirani to act in response to Fred's letter. This happened fairly soon and I received a letter from him. The arrangement worked out with him was that I should visit London every Monday, when his group had special seminars and I could manage to make the trip with a 'day return' from Cambridge. He also said that he had a research grant that enabled him to reimburse me for my expenses.

This was of course, a great help since my financial situation was OK but not very comfortable. In my letter home I had written that I expected £ 250 from the Meek scholarship, £ 60 as cash that came with the Tyson Medal, £160 from Cambridge University as research maintenance grant, £40 from Fitzwilliam House by way of the 1912 Exhibition and £ 100 from supervising students, thus making up a total of £ 610 or so. In addition the Tatas had promised around £ 150, but I did not wish to include it as I still had to pay back the loan part of their original grant. Thus if I did not travel and kept the expenses to a minimum I could manage within £ 550, leaving around £ 50-£ 60 surplus.

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My immediate task was to find lodgings for stay. In fact I had made an arrangement with a landlady near St Johns College and she had let me keep my bags (not required for visit to India) in her house. However, a note left in my pigeon hole at Fitzwilliam by a friend Fazli Hasan informed me that the landlady was unable to accommodate me. Thus I was back to square one! Fazli's landlady had, however, offered to put me up till the end of September when the Term began. So I had some three weeks or so to find lodgings.

I had been looking for lodgings that would be closer to the city centre

than my earlier ones at 200 Mill Road. I also wanted one with a bathroom! The problem was not easy, as most good rooms were already taken. However, I recalled that a few months back an Indian whom I knew was staying in lodgings at 5 Collier Road. His name was Ranga (Pandurang) Kolhatkar and he had been visiting the UK to pick up experience of working in an electronics factory. He had chosen the famous Pye factory. The landlady Miss F.E.H. Swann was quite friendly and welcomed me as a tenant. She allowed Ranga and me to watch TV in her parlour if there was a particular programme that we wished to see. The location at 5 Collier Road was very close to Parker's Piece and so crossing it diagonally I was able to reach the Arts School and the Department of Applied Mathematics and Theoretical Physics (DAMTP) via the Downing Street. Chats with Ranga after dinner added to the attraction of these lodgings.

After returning from India, I called upon the families and seniors who had been so hospitable during my undergraduate days. I had brought little gifts for all of them and they were very well received. The Thatchers, the Cunninghams, the Jeffreys, the Lapwoods, the Williamses, Mr Walter, Dr Grave, etc. were as welcoming as before. I missed Peter Schneider, the Chaplain whom I had got to know so well since my accident: he was in Haifa, Israel on a new assignment.

I had purchased a shower attachment - a 'y' shaped tube that had showerhead at the single end while the two tubes at the other end fitted the tub-taps. It was a luxury to have a hot shower and I had a special bath on the Diwali day.

I still had the bicycle that I had bought from another student Rao during my undergraduate days. It was very useful in getting around, especially as I was also visiting regularly the University Library and the Observatories.

The year 1960 ended with Kumar Chitre and I both spending five days with the Lapwood family over Christmas. So we had a flavour of an English Christmas as celebrated in a family with children. They not only had a Christmas tree laden with presents, but also an overnight visit by Santa Claus! We also saw fireworks which included many displays I had not seen before. In the Lapwood house I also saw how everyone in the family took turns in doing the household chores. The days of domestic servants were fast disappearing.

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I discovered that life of a research student in Cambridge is quite different from

that of an undergraduate. There were lectures to attend, but they were not for exams and not as frequent. The relationship with the College was more tenuous, while there was a closer contact with the department.

As a research student I now had closer relation with the DAMTP which had just been set up with George Batchelor as its Head. He had to set up departmental facilities when there was shortage of space in the neighbourhood of the Cavendish Labs. He found a small hut opposite Silver Street and the Cavendish Laboratory, which he got refurbished and furnished so as to house students in astrophysics. This had a small room near the front entrance which Hoyle's senior students John Ireland and Sverre Aarseth shared, while eight desks in the main hall at the back housed junior students like us. I recall that there were seven of us, myself, Kumar Chitre, Ian Roxburgh, John Faulkner, Ken Griffiths and Chandra Wickramasinghe, all first year students and Joan Crampin from the second year. Chandra, John, Kumar and Ian faced the remaining three with one desk vacant. A black board occupied one wall perpendicular to our rows while the wall facing it had the entrance door. A pantry provided facilities for our tea club. The items, tea bags, milk bottles (delivered at front door), sugar and coffee powder was bought from our contributions. The going rate was one penny for coffee and halfpenny for tea! John soon evolved a system of accounting: against each name there was a row of squares. One full diagonal was drawn in pencil for coffee and half diagonal for tea. Thus a square with two full diagonals meant two pennies.

John came from St John's College and Ken from Clare. They both had come via the Mathematical Tripos just like Chitre and me. Ian had joined after graduating in Leeds in Yorkshire, while Chandra had joined from Colombo. Chandra liked to work by himself and rarely came in. The rest of us first year lot were regulars both in academics and in the tea club. Naturally we chatted a lot, without (I believe) disturbing our work output. I still have happy memories of that informal interaction, which ranged from our research problems in astronomy to town gossip!. One particular occasion I recall was when Ken in a fit of generosity, brought in jam tarts at afternoon tea, which we (ever-famished) youths devoured in no time.

For the same reason, the Wednesday seminars at the Observatory, organized by the Observatory Club were a source of attraction, since they were preceded by an excellent and sumptuous afternoon tea laid on by Mrs Redman, wife of the Director of the Observatory, Professor Redman and other wives of the staff there. They included sandwiches of various kinds, toasted teacakes,

scones and cakes. I used to ‘tuck into’ these delicacies shamelessly as did my fellow graduate students!

On one occasion while on my way back from the Observatory in the evening I discovered that the bulb of my bicycle dynamo was not functioning. Since it was an offence to ride a bike without lights after dusk, I walked on the footpaths, wheeling the bike with me. A police car passed by on Madingley Road and turned right on Wilberforce Road. I could have taken a chance and ridden the bike since the police car had gone ahead. But some cautionary thought advised me to continue walking. As I passed the Wilberforce Road, I saw the police car parked there facing the Madingley Road. Presumably the police expected me to fall to the temptation of riding the bike!

My weekly trips to London were continuing and I found lectures by Ray Sachs in Pirani’s group very useful for understanding the concepts of spin and shear in relativity. I occasionally ran into Bondi who was getting more and more involved in administrative works of various kinds and so had been a less frequent participant of Pirani’s seminar activity. The days of fierce activity that led to a series of papers on gravitational radiation by Bondi and others were nearly over. A younger member of the group, Roger Penrose, was now beginning to make his name as a general relativist and participated in the discussions that followed Sachs’ lectures.

During my first year at Cambridge, I was also trying to get Anant admission and a research scholarship to come to Cambridge. Fitzwilliam House had promised to admit him if he got admission to the University. Dr Grave had been very positive about it. For admission to the University, there was need to have a department admit Anant as a research student. Anant’s interests being in crystallography, I was trying to get him into the Cavendish. The process was, however, not making a satisfactory progress. For, even if a definite interest were shown by some faculty member in the Cavendish, the need for a research studentship was still there. The BHU had promised Anant a Holkar Fellowship if he got into Cambridge, but the amount £ 150 per year was not sufficient to cover all his expenses.

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Fred Hoyle duly returned from the USA, and started visiting our ‘hut’. I recall how expectantly we all awaited his first visit. Ian Roxburgh was specially eager to meet him, since like Fred, he also came from Yorkshire. That day he wiped the board clean, tidied up the hall in which we sat and kept his desk spick and

span. Fred duly walked in and had preliminary chats with all of us telling us that he expected to have an office in the hut too, in the as yet unoccupied room there.

Barbara Hoyle was very hospitable and invited the three Asian students, Chitre, Wickramasinghe and myself to tea. It was a typical English tea with the main highlight being 'gram's scones, the fresh scones baked by her mother Mrs Clarke. Afterwards we were taken to see the film *Versailles* at the Arts Cinema, followed by dinner. It was certainly a memorable outing. I had been seeing classic films at the Arts Cinema as well as plays, pantomimes, musicals at the Arts Theatre.

During Hoyle's absence, Ray Lyttleton had been my supervisor, although his interaction with me had been nominal. He did not have much interest in cosmology and his area of interest did not have much overlap with mine. So I had only one discussion with him. It was Pirani and his colleagues at King's College, London that really led me forward in my research during that first term.

Meanwhile, I learnt a positive news about possibilities for Anant's admission to Cambridge: Professor Alan Cottrell Head of the Goldsmith's Labs in Metallurgy was willing to admit him for work towards a Ph.D. degree. The Goldsmith's labs was next to the Cavendish and also had a good reputation. I urged Anant to apply to Professor Cottrell. I later learnt that Professor Cottrell was a good friend of Professor Hoyle.

During the three months or so in the absence of Hoyle, I had been working on the model of a spinning universe proposed by Otto Heckmann and Englebert Schücking. Hoyle had asked me to check if the model oscillates between finite sizes as the authors of the model had hoped. If it did, I was to explore how atomic nuclei behaved in the hot phase of the oscillating universe. My work, however, showed that the universe *did not* oscillate and in fact its behaviour became very unphysical. Hoyle found this conclusion very interesting and was keen to help me publish it.

However, a rather unexpected event occurred that turned the direction of my research in a significant way!

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Fred Hoyle was one of the three originators of the steady state theory of cosmology, the other two being Hermann Bondi and Thomas Gold. This theory of the universe stipulates that the universe is infinite in extent, is without a

beginning and without an end, is expanding steadily all the time and has matter created in it continuously. To understand this concept better, think of capital invested in a bank which offers a fixed rate of *compound* interest. That is, the interest accrued is constantly added to the capital which therefore grows too, along with the interest. The universe expands like the capital with compound interest. However, as the name ‘steady state’ implies, the universe always presents the same appearance to any observer. Such an observer, for example can measure the density of the universe from time to time. He or she should find the universe to have the same density at all times. How is this possible, when we know that anything that expands becomes diluted and less and less dense? To answer this question Bondi, Gold and Hoyle had to conclude that there is new matter created to make up for the diminishing density of existing matter.

So the steady state theory predicted that the density of matter in the universe would always remain the same. It was the same, say a few billion years ago, as it is now and as it will be a few billion years in the future. In this respect the theory differed from its rival, the *big bang theory* which assumed that the entire universe that we see today came into existence in one go, through a primordial explosive creation event called the ‘big bang’. At this stage the whole universe was confined to a very small volume, literally a point, and through the explosion it started expanding. There was no subsequent creation of matter and so the universe would have a diminishing density as it grew bigger in size.

Can this prediction be tested? This is what radio astronomers in Cambridge under the leadership of Professor Martin Ryle at the Cavendish Labs proceeded to do. They had a long programme of observing radio sources, which were largely galaxies emitting radiation very powerfully in radio wavelengths, at greater and greater distances. They argued that typically a distant galaxy will be fainter and so they used the radio flux received from a source as an indicator of its distance. As they surveyed the cosmos they counted the galaxies out to fainter and fainter flux levels and their claim was that the density of radio sources kept on increasing the farther they counted. Now, when an astronomer observes a distant galaxy, he or she sees it as it was in the past, because light waves (or radio waves) take time to travel to us. So translating distance into times in the past, Ryle concluded that the density of radio galaxies increased in the past, just as the big bang theory predicted, and opposite to the conclusions of the steady state theory.

Ryle and his sponsors the Mullard Group which had funded the radio astronomy labs in the Cavendish, saw to it that great publicity was given to these findings. There was a press conference, which Hoyle was also invited to

attend. He did and that turned out to be a tactical error. For he did not have a convincing reply to Ryle's assertions, largely because he had not been shown the data on which the claims were based. In retrospect, he should have declined to attend till he were shown the data. Anyway, after the newspapers came out with headlines that 'Ryle had discovered the origin of the universe' the real chance of a reply was at the Royal Astronomical Society (RAS) where Ryle was to present his findings. At least here, far from the glaring media headlines, Hoyle expected a level playing field for his reply to Ryle.

That meeting was scheduled on Friday the 10<sup>th</sup> of February. All standard meetings of the RAS were traditionally held in Burlington House on Piccadilly on the second Friday of every month. About ten days prior to that date Hoyle called me and asked me if I would work on a mathematical model within the steady state theory that would explain the Ryle data. He had the germ of an idea and I could see what needed to be done. But first we needed access to Ryle's data.

And here I discovered what many other astronomers had found, that Ryle was extremely secretive where data were concerned. We met him over tea in the Cavendish tea room and he produced a hand drawn curve on a graph paper with a few numbers jotted down on it. 'Explain that' he challenged, banging the paper on the table. The numbers were all we had to go on with no details as to how they were arrived at and what were the experimental errors. Normally such numbers are obtained by 'reducing' the data, that is, applying certain mathematical operations on them. These operations can be at fault, the data may be containing more errors than the observer responsible for obtaining them may believe, the instruments taking those observations may have bugs...these issues need to be looked at before ascertaining the credibility of the claim. This luxury was denied to us since these details were 'not for the outsiders'. So we came away with the challenge to explain that crudely drawn curve.

I will not go into details except to say that we built our model around two assumptions each of which we felt were justifiable. First we assumed that the universe was inhomogeneous on the scale of 'superclusters' extending to a size of 150 million light years. Secondly we assumed that the chance of a typical galaxy becoming a radio source increased as it grew older. There was new evidence that galaxies in the universe were not only clustered in groups of several hundreds to a thousand galaxies or so, but that even clusters were grouped in groups that could be called superclusters. Also the detailed studies of a few radio sources had suggested that they were in old galaxies. So coupling these

assumptions to the mathematical model of the steady state theory we worked out a theoretical curve to match the observational curve supplied by Ryle. These curves suggested that up to a large enough distance, the number of radio sources would appear to increase rather rapidly, but beyond that, their numbers would start falling. We argued that Ryle's studies were limited to that distance, that further more far reaching surveys would show the expected drop.

I recall using desk calculators as well as the primitive electronic computer called the *EDSAC* to churn out the numbers which I plotted onto a curve. We found that our curve fitted Ryle's data rather well and this encouraged Hoyle to ask the RAS for a guaranteed time for presenting our work after Ryle presented his. The RAS allowed us ten minutes. It was then that Hoyle discovered to his horror that he had already committed to a lecture at the University College, London in the afternoon of the very same Friday. So he turned to me and said: "Well, Jayant, it looks as if you will have to present this work to the RAS".

I shuddered at the prospect. I recalled in my mind Hoyle's earlier statement on the first of our meetings in June, that he would not like me to work on the steady state model as he felt that a new research student should stay away from controversy. Here I was walking right into a prime controversy at no less a place than the RAS that had witnessed controversies involving Jeans, Eddington, Milne and Chandrasekhar. That too when I was barely six months old as a research student. Seeing my hesitation, Hoyle said that if I had confidence in the correctness of our results then there was nothing I should fear in a controversy. He also remarked that at the RAS I would be bound to meet Hermann Bondi, who would be able to see the logic of our work and can be relied on to support us.

Reluctantly I agreed and then Hoyle coached me on what to say and when to show what slides. The slides those days were made in the Engineering Labs and we had them in hand only the day before we were to go to London. I had just become a junior member of the RAS, a status accorded to students. I had been to a couple of RAS meetings earlier and so knew the drill. Still it was the first time I was making a public speech in England and that too with some hostile audience (the radio astronomers) present. The tea served before was sumptuous as usual but I do not remember enjoying it. I wanted to 'get it over with my lecture' as soon as possible.

Ryle gave his talk for about thirty five minutes. He showed slides of various kinds including the observational curve that he had shown us in crude form earlier. I was relieved to see that it did not differ from what he had given

us and what we had based our calculations on. After he sat down, the President asked Hermann Bondi to reply first, since he was a senior astronomer, an originator of the theory under attack and also the Secretary of the Royal Astronomical Society. In a brief comment Bondi recalled Ryle's earlier work in which he had claimed even more drastic differences between his findings and the predictions of the steady state theory. Over the years (quoting figures), Bondi argued that Ryle was in fact coming closer to the steady state theory since each time he discarded his earlier observations as being unreliable. In a sarcastic vein, Bondi added that he would wait a few years when Ryle finally agreed with the steady state theory. This was good for a general laugh but did not please Ryle, of course. Then came my turn.

Unlike Bondi, I began by taking Ryle's data seriously and asking how we can explain them in a steady state universe. As coached by Fred, I completed my account of how this could be done in about eight minutes. There were some remarks by Ryle expressing his disbelief, but he could not argue further when I mentioned that these numbers were obtained by direct computer calculations based on his own data!

After the meeting, several astronomers, including Bondi, came to me to say that I had spoken well and that they were interested in knowing the details of our model. To many what we had achieved was incredible, but Bondi was sharp enough (as Hoyle had predicted!) to be able to see the reason why our 'trick' had worked. I was particularly pleased when one lady scientist in Ryle's group approached me to say that she found my reasoning impressive.

I came away from the meeting a good deal relieved that I had not bungled, that I had exuded confidence in what I was talking about. More importantly, I felt that henceforth I would not be nervous in participating in a scientific controversy.

## WORKING FOR THE SMITH'S PRIZE

THE days of intense activity that preceded the controversy with Ryle were followed by a few days of relaxation. I recall seeing the musical ‘My Fair Lady’ for the second time, on this occasion Ranga Kolhatkar and Dr Talwalkar were with me. By now I had become quite at home with London and did not feel the awe of the city as I had felt back in 1957 as a raw student from India. I, however, recall writing home that soon after the RAS adventure, some of us students went to London in a car and got lost in the maze of one way streets, going round and round Trafalgar Square!

There was, of course a lot of publicity given to the Hoyle-Ryle debate, but this time there was a more balanced approach with our reply to Ryle also being given space. I recall a well reasoned article by Tom Margerison in the *Sunday Times*, for example. A photographer from the *Life* magazine also turned up in Cambridge to photograph Hoyle discussing with his students! An account also appeared in the French fashion periodical *Paris Match* in which I was described as a young man with eyes wide open like ‘flying saucers’. My fellow research student in Fitzwilliam, David Atkinson, a particle physicist, translated the article for me with his English-school French. David was himself driven to poetry by the episode:

*Nature and Nature's laws lay hid in night  
Ryle said, “The Lord God be” and there was light.  
But not for long, with Fred Hoyle howling “Ho!  
“The Devil take it! The Steady State is so!”*

However, as Hoyle was well aware, the real arena for such a battle was not the

media but the professional community. As such, it was important to get a paper out in a reputed journal like the *Monthly Notices of the Royal Astronomical Society*. And for that, we needed to carry our work a lot further than what we had so far done. It was also axiomatic that we would not get much co-operation from Ryle and his group by way of data on radio sources. And Hoyle believed (rightly so) that if one is drawing profound conclusions by counting radio sources, then one needs to understand first what these sources are made of. Of that in 1961, there was very little information.

Apart from Cambridge, there was another large centre of radio astronomy in the UK, at Jodrell bank, a few kilometres from Manchester. It had the world's largest radio dish, with 250 feet diameter, and it had been in operation for several years. In the popular mind, the radio dish had played a significant role in locating signals from the Russian spacecraft *Sputnik*. At the technical revel, the dish was playing a major role in determining the structure of a radio source. Moreover, the Director Bernard Lovell and his senior colleague Hanbury Brown were on very good terms with Fred Hoyle. They responded very positively to Hoyle's queries and Hanbury invited him to come to Jodrell Bank. Hoyle suggested that I accompany him to Manchester and Hanbury gladly extended his invitation to me too offering to put up both Fred and me.

So one fine morning at eleven, we set off in Fred's light blue sports car, the Austin Healy Sprite. For me it was an exhilarating experience, not only to travel in an open car (as one saw in Indian movies!) but also that I was participating in a quest along with one of the brightest minds of the times. I was also very excited by the fact that Fred Hoyle was treating me as a colleague rather than as a student. In days when motorways and by-passes were not in existence in the UK, one went along the A-roads winding through cities. We drove through Huntingdon, Kettering, Market Harborough, Leicester and Derby. I recall standing in a very long queue at a self-service lunch place in the Woolworths at Leicester. We reached Jodrell Bank at a quarter to four and I found the famous radio dish really very impressive.

Hanbury Brown could not have been more co-operative in supplying data that he and his colleagues had collected. Radio sources at that time were ill-understood objects, far less detailed in structure than the stars and galaxies of optical astronomy. Compared to today, half a century later, those items of data look very primitive. Yet one has to pay tributes to the early pioneers on whose work the present more detailed studies are based. For example, Hanbury pointed out two types of radio sources, to begin with. One set of sources had extended structures presumably (at those times we could only form crude guesses

for what we now know for sure) much larger than galaxies. The other set, at that time more mysterious than the first one, seemed to contain very compact objects. They were compact but apparently as powerful emitters of radio waves as the extended sources. "What are those little chaps?" asked Hanbury as he went through his data.

It was already becoming clear that the population of radio sources was not a homogeneous one. Ryle and his colleagues were basing their conclusions on a very mixed population, like basing some survey of animals in a forest by counting the elephants and mice, *without the ability of distinguishing between them!* For, a survey of the kind carried out in Cambridge simply counted and classified sources as per their intensity of radio emission. As was to be shown later, most of those 'little chaps' of Hanbury were quasi stellar radio sources or *quasars*. But that discovery was to come later in 1963, as we will find soon.

After our discussions with Hanbury, we went to his home where we were to stay the night. Mrs Brown was very hospitable and I enjoyed the dinner at their place. Their daughter Marion then aged around seven was keen to study *Hindi* and asked me to write a few words in that language, which I did. She was then copying the letters laboriously for a long time!

Next morning after breakfast we visited a nearby park and picnic place. On the way back we ran into Lovell who showed us a telegram received from Moscow requesting him to track the recently sent spacecraft to Venus. He reported that till then the Jodrell dish had failed to get any signals from the spacecraft. However, shortly afterwards it became one of the crucial receivers of Russian spacecraft signals.

We reached home in Cambridge by around five in the evening. The weather all along had been very kind and so this trip was a memorable one for me in many ways, academic as well as for pleasure of travelling.

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The Jodrell visit was in early March. Fred and I were making progress with developing our model to greater and greater details and we were approaching the stage when we felt, we could put it all in a well-reasoned scientific paper. Fred needed an uninterrupted spell of a week or so to write the paper and felt that to get it he needed to get away from Cambridge, to some isolated spot in the country. Fortunately, a friend of his lent him the use of a country cottage in St Austell in Cornwall and we decided to go there from April 5 to 12, for working on our paper.

This time the Hoyles, Fred and Barbara as well as their daughter Elizabeth and myself did the journey in their land-rover. Apart from accommodating more people, this vehicle was suitable for the steep and narrow roads we would encounter in Devon and Cornwall. I was to travel in this vehicle a lot in the future whenever I accompanied Fred on his hikes to the Lake District and Scotland.

The cottage was situated close to the coast and so had a nice view. It was quiet and isolated from the general tourist flow, which had not yet started in earnest anyway. We followed a routine of getting up at 6.30 a.m. and having a cup of tea followed by work for an hour till breakfast. Then again we worked in the morning till lunch, followed by walks in the afternoon; then work again till supper time. The heating system was based on log fires and electric heaters. There was a boiler for hot water for the bathrooms. All in all I found the trip very restful despite the hard work we put in towards preparing the draft of our paper.

This was just in time! For on April 14 we were to present our work at the Royal Astronomical Society. We had been given nearly an hour for presentation but lost 15 minutes of it because of delays over earlier presentations. Of the 40 minutes left, Fred spoke for 25 minutes and I spoke for 15. There were 20 minutes left for discussion and distinguished astronomers like Martin Ryle, Bill McCrea, Hermann Bondi, Bill Davidson, John Shakeshaft, Bill Baum, Graham Smith took part. The hall was packed to beyond capacity and it was felt that there should have been more time for discussion.

After the meeting Fred went for the RAS Club dinner at the Athenaeum, while Barbara took Wickramasinghe (who had also come to the RAS meeting), Elizabeth and me to a play called *The Caretaker* at the Duchess Theatre. Her sister Jean married to a clergyman in Scotland also came for the play and dinner. Later Fred joined us and drove us back to Cambridge.

Although the paper was eventually written, submitted and published by the *Monthly Notices*, by that time I had already new problems to work on. I had also been encouraged by Fred Hoyle to try for the Smith's Prize next year (1962) which was awarded to the best essay on a research topic written by a research student in mathematics in his/her second year of research (more correctly who had not spent more than six terms since getting the B.A. degree). For that I needed to concentrate on a specific research problem of sufficiently deep significance, since the Smith's Prize was a very distinguished award and had been won by several Cambridge luminaries in the past such as Thomson, Stokes, Maxwell, Hardy, Littlewood,

Eddington, etc. As things turned out, I was led to such a problem quite naturally during 1961.

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All this while, I had been pursuing ‘bread and butter’ problems also! I had been promised a research maintenance grant for research, but I was also eyeing the possibility of getting the prestigious Isaac Newton Studentship, which my father had won during his tenure of research at Cambridge. I applied for it submitting all the necessary documentation. However, one evening, I think on the last day of submitting the application, I received a message to call Professor Hoyle. I telephoned him from a public call office near Collier Road. He explained that as one of the referees for the INS, he was sure that I would get it since I had the best credentials. However, he would prefer it if I retracted my application for two reasons. One of his senior students was in greater need of money and it would be desirable if the INS goes to him. The second reason was that he had put in an application for a research grant from the Department of Scientific and Industrial Research (DSIR) which would cover my stipend at a higher level. He wanted to set a precedent for such grants and would like to start with a ‘strong’ case like mine. At his request therefore I wrote a letter to the INS secretariat withdrawing my application that very evening.

Around the same time there was another source that came out with the offer of a handsome scholarship. This was the Commonwealth Scholarship and Fellowship Fund. Normally students applied to this fund for scholarships after their M.Sc. degrees at home in a commonwealth country. These were well endowed and meant for such students to work in the UK to acquire special skills and value addition, which would help them when they returned to their mother countries. Dr V.S. Jha, who had earlier been Vice-Chancellor of BHU when I was a school student there, was the Secretary General to the Foundation and had encouraged me to apply. My application succeeded and I was informed by the Fund that I would receive the scholarship from October 1961.

However, there was a likely snag in accepting the handsome offer and Fred Hoyle alerted me to it. He felt that with the progress I was making, I was sure to get a fellowship at a Cambridge college, even before I got my Ph.D. and this would mean that I had to be in Cambridge for at least 2-3 years after my Ph.D. Did the Commonwealth Scholarship allow that? The rules as communicated to me said that after getting my Ph.D. I was expected to return

to India. Hoyle therefore did not want me to miss out on the possibility of a Cambridge fellowship (which was also considered a great academic honour), just because of the present financial reasons for which I was opting for the Commonwealth Scholarship. He himself wrote to the Chairman of the Fund to seek clarification on that point.

As a result, I received a letter from the Chairman of the Fund, Lord Scarbrough informing me that the rule about returning to one's native country was to be taken in 'spirit' rather than literally. As such, if my research work entailed my remaining in Cambridge for a limited period like 2-3 years before I returned to India, the Fund would have no objection to it. While this liberal attitude certainly would have prompted me to accept the award, I also received a cyclostyled barely readable missive from the Education Ministry of the Government of India to the effect that I was to sign an enclosed (even less legible) bond that committed me not only to return to India right after my Ph.D. but also to taking up any appointment offered by the Government of India for a period of three years. So the babus won over his lordship of the Fund and I declined the award.

Thus it was that I had declined two studentship sources within the span of a few months, in the expectation that Fred Hoyle would succeed in raising funds for paying me. Lest I felt that I might fall between two (actually three) stools, Fred assured me that he had got an assurance from the committee members deciding the INS award that if the DSIR grant did not come through, I would be paid out of the INS funds at their disposal.

My efforts to secure admission to Cambridge as well as a scholarship for Anant, also bore fruit around this time. He got admission to the Goldsmith's Labs of Professor Alan Cottrell as well as a fully paid studentship at Peterhouse. Coupled with the Holkar Fellowship that he would be entitled to, Anant was now assured of a comfortable life as a research scholar. I had got a hint of his success with the Peterhouse application, when I ran into Dr J.C. Burkhill, a senior mathematician of Peterhouse, at a seminar at the Royal Society. Dr Burkhill gave me a bright smile without conveying anything verbally...the next day the letter offering the Peterhouse studentship was despatched to Anant!

I felt particularly relieved by this event because I as well as Anant were getting frustrated by the difficulties of getting admission to a good research school and a scholarship to go with it. I had also been feeling that the privileges I was enjoying, of a Cambridge education, should also be available to my brother. This had now come about. My seniors at Fitzwilliam as well as the Hoyles were pleased with this happening.

By a happy coincidence, the issue of the Cambridge University Reporter carrying announcement of Anant's Peterhouse award, also carried the announcement of the very prestigious Adams Prize to Vasantmama. The Adams Prize is given every year to the best research work submitted in a topic previously announced by the University. *All* Cambridge degree holders are entitled to compete, whether in residence or not. Thus though the subject is narrow, the field of contestants is quite wide. A year or two back I had noticed the announcement of the topic and remembered that Vasantmama's research lay in that direction. So I had sent him the clipping of the notice and left it to him to decide whether he would try for the prize. He did and was successful in winning it...he had shared it with another statistician Professor Smith.

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I was now considering plans for the long vacation, trying to optimise ways of combining academics with tourism. An excellent opportunity came my way through the poster advertising the Varennna summer school in June. Varennna is a small resort place on Lake Como near Milan in Italy and it has a villa known as the Villa Monastero which has excellent facilities for organizing summer schools. The series of schools in the memory of Nobel Laureate physicist Enrico Fermi attract very good teachers and students. The second school for the summer of 1961 was on gravitation theories and was therefore in my line. As it happened, the earlier (first) school was on a topic close to Chandra Wickramasinghe's and he had received admission and scholarship for attending it. When I applied, I too received admission but there was no mention of a scholarship. So I went to see my tutor Norman Walters at Fitzwilliam, and he readily promised a sum of £20, matching what Chandra had been promised. He later raised it to £25, thus making it simple for me to arrange my trip.

At this stage, Barbara Hoyle came up with a plan that made my prospective trip even more interesting and enjoyable. She had wanted to visit France to look at the old chateaus on the river Loire. She suggested that I accompany her in their sprite car on my way to Varennna. Fred was due to speak in the first as well as the second Varennna schools and so could not come. As she did not want to go alone, she asked if I could come. I readily agreed since it gave me chance to see something of France.

I sorted out the visas needed for the travel in time for us to leave Cambridge on a warm and sunny June morning. Fred bid us good bye, reminding Barbara to remember that driving in France one has to give priority on the right at

roundabouts and other junctions. We took a plane at Lidd to Calais, the car being transported by plane too. We drove out of Calais around four in the afternoon and stopped for the night in an inn in Rouen, the town where Joan of Arc spent the last days in her life. We saw the cathedral in Rouen as well as the more famous one in Chartres the next morning.

We did not wish to go through Paris, and made a right turn to head for Angers. This is where I began my encounter with the Chateau country. The drawbridge, the ramparts, etc along with the art treasures inside are the hallmarks of these ancient relics well preserved through centuries. The drive along the Loire river takes one through several of these magnificent buildings. We saw some of these as per the Michelin guide that Barbara had, which also advised us about places to stay and eat. We stopped for the night in Saumur in a hotel on the river bank. It was here, I believe, that I had the first taste of that famous French dish 'coq au vin' (chicken cooked in wine).

From Samur we went to Chinon to see the chateau on the hill top commanding a grand view of the countryside. From there to Azzay then to Chenonceau and somewhere in between we encountered our first dose of rain. Travelling in a car with the top off, we were very vulnerable but after getting the roof down and starting the heater full on to dry the seats we somehow managed to cope with the downpour and its effect on the inside of the car. We stayed in a small town which also had a childhood friend of Barbara residing there. We went there unannounced but the French family of Madeleine and Rene, their daughter Dominique and Rene's parents welcomed us with open arms. Madeleine had been with Barbara when she had visited France to learn French as several English children used to do. They insisted that we had dinner with them and also pressed us to stay in the town until lunch the next day.

We saw the chateaus of Blois and Ambois the next morning and set off after our lunch with the family to Bourges and Nevers. The country we passed through had several associations with Joan of Arc and Dumas novels like The Count of Monte Christo and Three Musketeers. From there we crossed into Switzerland and headed for Geneva where Fred was to join us. The arrangement was that I would then take a train and meet up with them coming by car at the mountain resort of Zermatt.

Fred was due to arrive by plane and we went to the airport to receive him. The car did not have a third seat and so we decided to drive to the railway station with I sitting on the back portion of the open car where normally a suitcase can go in. Those days seat belts were unheard of and so driving like this was not illegal. We made it to the station where I purchased a ticket to

Zermatt via Visp. I enjoy train rides and this one was one of the most pleasant ones I recall. It was a fast electric train winding its way along lakes and mountains. I slept at the hotel next to the Visp railway station and took the small mountain train to Zermatt. No cars were permitted in the resort town dominated by the Matterhorn peak. At the station tourist house I got a list of hotels and pensions and picked one (Pension Breithorn) for my stay. It provided room, breakfast and dinner for the English equivalent of 22 shillings and sixpence, cheaper than in England.

The Hoyles were to come to Zermatt the next day and as per Fred's suggestion, I left a message *poste restante* for them at the post office, informing them where I was staying. They got in touch with me the next day...they were staying down the same road closer to the foot of Matterhorn.

We met for tea and I noticed what I had observed before also. Having ordered tea and waiting for it to arrive, Fred pulled out a pad and continued writing something. He later said that he was writing a play for children. It was characteristic of him to fill up small gaps in time with useful work, a trait I learnt from him. I had also noticed when going on tours or hikes with him that he kept thinking of science or some other creative idea all the time. Even on this trip, as we went for hikes in the Matterhorn area he had been musing on some idea or another.

The Matterhorn with a height of 4600 metres, had a bit of snow at the top, although there were shorter walks for those who wanted to have the flavour of the area. Part of the way is covered by a small train which I enjoyed riding. I also took chairlift to Stockhorn at a height of 3500 metres. It was here that I realized how uncomfortable the glare of sunlight reflected from icy faces can be for, I did not have sunglasses with me.

Soon, however, it was time to go to catch the train for Milan and from there to Varenna. I took the Milan train just in time by running down the platform at Visp. As I was walking down the corridors of the train looking for a seat, I noticed John Faulkner in one compartment talking to none other than Amartya Sen! I could join them and had an enjoyable time to Milan. At Milan we took a train to Varenna which went along the lake Como and took two hours to reach its destination where we were met by the local organizers.

We students had a shared-room accommodation in a big hotel near the Villa Monastero. My room-mate was Hussein Yilmaz from Turkey. He was a jolly character who described to me his mis-adventure at Milan station. He had confused Varenna with Verona (from Shakespeare's play) and had travelled to the wrong place! He told several jokes and also had an interesting theory of

gravitation. I later met him when he visited IUCAA in Pune where I was Director, some three decades later.

The lectures at the school were informative, and I was fortunate to have as teachers Alfred Schild, Bruno Bertotti, Joe Weber, Moller and Bondi. Their lectures were interesting apart from Hoyle's own course on cosmology. He referred to our work and I was invited to give a seminar on my work on spinning universes. This talk subsequently appeared in the proceedings volume of the school.

However, the talk that was to a large extent determine my future interests in research was delivered by Bondi. I recall him arriving from Milan on a day when the weather had broken with rains pouring down after prolonged spells of sunshine. He was suffering from hay fever and was 'exploding' with sneezes. Still he gave his talk which was on the work of a Canadian student of Bill McCrea. Jack Hogarth was his name and he had extended the work of two distinguished physicists, John Wheeler and Richard Feynman done in the 1940s. It related the directionality of time in cosmology to the directionality of time in the way radiation is emitted. This is not the place for describing that work, but its conclusion is worth stating. Hogarth had shown that the two arrows agree, i.e., point in the same way only in the steady state universe but in none of the big bang universes. Both Fred and I were excited by this result, as Bondi was, since it confirmed our view that the big bang model cannot be right.

Beyond the lectures there were occasions to relax, go for hikes, for swim, boat rides on the lake, for informal parties, etc. We all celebrated Fred's 46<sup>th</sup> birthday on June 24 with a party. While we were finishing up at the school I went to the school office to settle my dues and I was in for a pleasant surprise. I was told that there were no dues as I had been one of the scholarship holders! Like Chandra I too had been given a scholarship but somehow there was an information gap.

On the way back John Faulkner was to travel with me, since we both had reservations on the same train. However, at the last moment he could not locate his ticket and so had to postpone his journey by a day. The missing ticket later turned up in his suitcase, securely packed!

On returning to Cambridge I mentioned my getting a scholarship from the Varennna school to my tutor Norman Walters, and offered to return the amount that Fitzwilliam had given me. He smiled and said: "You do not need to return the amount; go and have a party!".

Soon after my return from Varennna I was due to set off on another ‘working’ holiday, to the Royal Greenwich Observatory for a summer student programme. The RGO was initially based in Greenwich, a southern suburb of London. However, the growing threats of London’s urban lighting (-astronomers need a very dark sky for their observations-) drove the observatory further south to the ancient castle of Herstmonceux in Sussex. The castle was situated in rolling parkland and there was hardly any illuminated zone nearby. So the telescopes were sited in the grounds of the castle, the offices located in the various staterooms while there were a large number of rooms, largely unoccupied but suitable as bedsitters. The RGO used to hold a summer programme for 40-50 students. There were a few lectures by astronomers, some lab-work on data reduction, actual observing on the telescopes and also, in some cases, seminars by students. Each student was assigned to a senior astronomer acting as a supervisor.

My supervisor was Olin Eggen, an American who had joined the British establishment. He knew that I was a research student of Hoyle and so left me to my own devices for pursuing my research, with some lab work to get to know how astronomers deal with observations of photometry and spectroscopy obtained with their telescopes. I also had two nights out for observing. The one I specially remember was with Bernard Pagel on the evening of my birthday, July 19. We used the 36-inch telescope to get spectra of some stars. The night was clear and very good for observing so that we could continue till almost dawn. Pagel had brought sandwiches and apples as well as thermos-ful of hot tea by way of sustenance, which were very welcome around the early hours of the morning. I made up for lost sleep by having a four-hour long siesta after lunch!

At Herstmonceux I used to work in the library and was able to spend long hours on my research ideas. I found an interesting result using the mathematical formalism on creation of matter, which seemed to suggest that provided the universe had had a long enough lifetime in the past, the creation of new matter brings in regularity to its large scale structure. This seemed to explain why the present structure of the universe has so much regularity. I wrote about the result to Fred Hoyle who was very excited by it and later he arranged for it to be presented at a meeting of the Royal Society. This work formed the nucleus of my Smith’s Prize essay the following year.

The Astronomer Royal was Sir Richard Woolley, who lived on the campus. He was fond of the game of croquet for which courts existed in the castle. There was provision for tennis and cricket also. We had occasional social events.

The AR was fond of country dancing and there were some evenings devoted to that. Once Lord and Lady Killearn organized a ball. It was a formal occasion where evening dress was obligatory. Although we students were invited, very few of us went for that reason. There were young men and women from high society and festivities went on till the early hours of the morning. The AR had securely locked up all the sensitive equipment for fear that some of the youngsters who had too much to drink might cause damage to them. I was reminded of P.G. Wodehouse stories in which young men pinch policeman's helmet during festivities in the night of the Oxford-Cambridge boat race.

Eggen also gave me a large number of Perry Mason novels from his private collection to read. This was my first introduction to Earl Stanley Gardner...and I enjoyed those mystery novels. As if to add to the mystery, we were told that the castle had a ghost! It was the ghost of a drummer and was supposed to reside in the drummer's room. Apart from roaming around in the castle precincts, we students had plenty of time, especially on weekends, to explore the seaside places of Hastings, Eastbourne and Brighton.

The four weeks at Herstmonceux therefore went off in a whirr. I recall that in the closing stages there were some competitions organized by the students and I won the table tennis singles crown. My opponent in the finals was Stephen Hawking who had come from Oxford. Apart from him there were several other students who later became professional astronomers in their future careers, such as Carol Jordan, Michael Friedjung, George Miley, etc.

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I returned from Herstmonceux in early August and had another trip to follow, this time not linked with any academic programme. I was to join Barbara, Elizabeth and Geoffrey Hoyle in their camping holiday in Cornwall. Geoff, the son of Fred and Barbara had earlier been on a round the world tour as a 'reward' from his parents after clearing his schooling. He was to join St John's, Cambridge in the following term to do the economics tripos. This would be the first opportunity for me to meet him for any extended period of time. John Faulkner was also coming to this camping holiday. Fred, however, was not able to come as he had other commitments.

I arrived at the camping site, which was in a farm near Bedruthan Steps, in the neighbourhood of a village called Trenance. The Hoyles had a caravan which was brought from Cambridge pulled by their Land Rover driven by Geoff. They had come a couple of weeks before I joined them. The arrangement

was that the ladies, Barbara and Elizabeth would sleep in the caravan and men, Geoff, John and I would sleep in a tent set up nearby. After the camping in the Lake District during my first year in England, this was my second camping experience. Cooking was done in the caravan with a portable gas cylinder as the source of heat. Except me, all others partook in cookery; my own contribution was limited to making tea.

Another late joiner was Ross, or Roselyn who was Elizabeth's schoolmate and daughter of the then Lord Mayor of London. She also slept in the caravan with the other ladies. We had newspapers from the village store and one important news item that I recall from those Cornish days was the building of the wall separating East Berlin from the West.

We explored the Cornish countryside in the Land Rover and on foot, visiting places like Padstow, Bedruthen Steps, Truro, St Ives, etc. We of course sampled fish and chips, cornish pastie, cream teas, and other local delights. Barbara had noticed my partiality for cream in my tea and ensured that I would be indulged with it. Despite this varied schedule with no rigid time keeping for daily meals, I managed to do some work on my research problems.

Amongst other things, I was following up on a suggestion by Bondi as to whether the Wheeler-Feynman idea on arrow of time could be followed up for neutrinos. In those days it was believed that these sub-atomic particles travel with the speed of light, and so like photons (the particle of light) which were considered by Wheeler and Feynman as travelling backward as well as forward in time, the neutrinos also might have that property.

While in Cornwall, Barbara suggested that it would be fun if we all visited Paris for a week or so in early September. She had been to Paris several times and spoke French well. I recalled with pleasure our tour of the Chateau country in the early summer. On that occasion we had given Paris a miss since it would not have been possible to do justice to the beautiful city in a matter of two days. Barbara found a suitable hotel to stay for us, the Grand Hotel du Globe in Rue Croix des Petits Champs, not far from the Louvre. We decided on dates too: September 8 to 18.

I left Cornwall on August 28, principally because my school friend Anantha Dasannacharya (alias *Papu*) was passing through London on his way from Canada on the 29th and I had arranged to meet him at the Victoria Air Terminal. He was coming into London early in the morning and departing for Bombay late the same evening. So he had a few hours to spend in London in between.

I had taken a night train with sleeper accommodation from Truro in

Cornwall to London. The distances in England are small compared to those in India and so with this fast train we were scheduled to reach Paddington at around four in the morning, too soon to get up and move about! Very thoughtfully, the railway administration had permitted the train to remain on the platform till seven in the morning, and the sleeper passengers could continue sleeping there till that hour.

The reunion with Papu was delightful and we went round the tourist attractions of London. Papu had not been to London before and so the places like Madame Tussod's, the Tower of London, Buckingham Palace, Trafalgar Square, etc., were a great attraction to him. He told me that on his way to Canada a few months back he had similarly stopped in London but there was not enough time to look around. As a result he had stayed at the terminal and because of jet lag fallen asleep. His sleep was so deep that he missed his onward flight when it was announced!

\* \* \*

The time to leave for Paris soon arrived. We were to go in two groups. Barbara Hoyle and Elizabeth were to go by air to Paris while Geoff, Kumar Chitre, John Faulkner, Geoff's friend Paul Debenham and I were to go in the Land Rover. This way we could transport all our bags and also ensure that in Paris the whole group could move in one vehicle.

This was my first visit to Paris. The weather had cooperated in making it very pleasant. Barbara knew the city well and chose our itinerary for the day every morning. Our hotel was centrally situated and so travelling in metro was very convenient. The Paris Metro was not as elegant looking as its London counterpart the 'tube' or the 'underground'. But it was cheaper and covered more region of interest than the tube did in London. We saw the Louvre, the Versailles, the impressionists gallery which was then located not far from the Louvre, and Notre Dame. We did the boating on the Seine, visited two night clubs, the *Moulin Rouge* and the *Lido*. In short, we did a very extensive tour of the city.

I was also building up on my earlier experience of the Loire Valley tour to get more diverse specimens of French food. We sampled restaurants of all sorts, more commonly in the student-dominated area of St Germain and St Michel boulevards. I noticed the vast difference in the quality and variety of food once one crosses the Channel.

We did not have access to English papers but could make out the French

headlines displayed at street corners where papers like *Le Monde* were on sale. My French was very rudimentary but even I could follow the headline to which a shocked John Faulkner drew my attention. It announced the death of the UN Secretary General Daag Hammershold in a plane crash in Africa.

I recall that our final night was spent at the Lido in the Champs d'Elyses. Some of us (myself included) went to see the floor show, while Kumar Chitre and John Faulkner opted out and slept on benches on the footpaths. The show was over at around 3 a.m. and we left for the ferry, which crossed the English Channel at Boulogne. The entire journey was very memorable and I developed an affection for the city which has remained to this day. Although it was only a ten day visit, it made me feel quite at home in the city and I enjoyed visiting it on my future trips to the Continent.

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Despite these visits outside Cambridge (Varennna, Herstmonceux, Cornwall, Paris, etc.) I was keeping in touch with Anant during his final days of preparations for coming to Cambridge. There were numerous practical questions from him as well as from my parents, to which I would reply. Certainly he had the benefit of advice from someone who was *in situ*, an advantage that I did not have. Also I was keeping track of his boat on the Anchor Line. It was to arrive and dock at Liverpool on October 3 in the evening. Disembarkation would take place early morning the next day. There was a boat train to London leaving at around 9.25 a.m.

I was planning to visit Liverpool and receive Anant. The above schedule required finding suitable overnight accommodation in Liverpool. I had no local contacts there, but my father informed me that one Dr Kulkarni, son in law of Shri Annasaheb Kurane of Kolhapur (a family friend) was working there. Dr Kulkarni booked me in the YMCA and invited me to dinner on the 3<sup>rd</sup> evening. I really enjoyed the excellent home-cooked Maharashtrian food at the Kulkarni residence which was not too far from the pier. The dinner over, I took a stroll to the pier and saw that the boat had docked. I had a pass to go on the deck for the following morning, but I took a chance and found that I could get on the boat that evening. I ran into Anant on the deck and he was certainly relieved to see me. We arranged to meet the next morning and after the disembarkation formalities to go to London by the boat train.

All that worked out exactly as planned and we got into a compartment in the boat train. There were other Indian students in it and except for myself, all

of them were first-timers to the UK. It was interesting to hear some of their conversation. One person in particular, was very assertive about life in England. Shortly after the train left Liverpool, it got into a tunnel and our worthy companion stated that this was the famous London underground and that the train would now emerge in open air only after reaching London! Like his other statements, this one too was easily disproved.

The train reached Euston at around 2 p.m. Taking the opportunity of showing a first glimpse of London to Anant, we took a cab to King's Cross, placed our baggage in the left luggage area, and took the underground to the West End. A few highlights like Piccadilly Circus, Buckingham Palace, Hyde Park, Marble Arch, Trafalgar Square, etc. were enough to thrill Anant...the weather had also been kind: it was dry and sunny. We reached Cambridge at around 6.30 p.m. Anant was safely placed in his room at St Peter's Terrace, the very hostel where Kumar Chitre had stayed.

The next few days were spent in getting the necessities for life, meeting friends in Cambridge and, of course, dealing with the College business as well as the contacts to be made at the Goldsmith's labs. In any case, compared to my first few days in Cambridge, Anant's were much more relaxed and he soon got acclimatised and began to feel at home in alien surroundings. Professor Cottrell placed him under the supervision of Dr Dew Hughes, a young faculty member.

\* \* \*

I had by now decided to seriously try for the Smith's Prize and to write about my work on creation of matter in cosmology. I had polished up the core I had worked on at Herstmonceux and Fred Hoyle had felt that that alone would be adequate for presentation as the Smith's Prize essay. I did not plan to include my work on the radio source counts which appeared in print, based on the paper we had written while visiting St Austell in Cornwall in the spring. But, I did include my work on the spinning universes or the work on Wheeler Feynman theory that I was now engaged in.

This work was related to neutrinos that Bondi had suggested in his lecture in Varenna. I had made fair progress in it but Hoyle felt that he would like a 'second opinion' from someone who was familiar with cosmology and particle physics, since both disciplines were involved in this work. Happily his longtime colleague and close friend from Caltech, William A. (Willy) Fowler had come to Cambridge for a term and was staying at St John's College. Fred arranged

several sessions with him and Willy present where I was asked to talk on what I had done, after giving sufficient background on the Wheeler-Feynman theory. These sessions went off well, and Willy made some good suggestions including updating me on interactions of neutrinos with other particles.

I recall giving two talks: one on creation of matter at King's College, London, where both Pirani and Bondi were present, and the other on the neutrino work in the DAMTP at Cambridge. Both talks went off to my satisfaction. Thus when the deadline for submission of the essay (31<sup>st</sup> December, 1961) approached, I was ready with the essay. I recall feeling very relieved that it was finally submitted, as well as full of doubts as to whether it will be adequate for the award.

Meanwhile my life at Cambridge was proceeding happily, being more enriched now that Anant was also there. We saw several movies, and pantomimes, and other shows around Christmas. I have not written in detail about specific shows, but ever since coming to England, I had been a frequent visitor to the theatre, enjoying cinemas, plays and other productions on the stage. I particularly enjoyed Gilbert and Sullivan operas performed those days in the form copyrighted by the D'Oyly-Carte company. In the autumn of 1961, the BBC began screening the science fiction serial *A For Andromeda* based on the novel of Fred Hoyle and John Eliot. It was a good work of science fiction and became very popular. It also brought into limelight the actress Julie Christie, then just out from her training in a school of drama.

I had been attempting to pass the driving test. Twice I tried and failed and was feeling somewhat dejected, when Mrs Clarke, Barbara's mother suggested that I get some practice driving her Hillman Minx, so that I have a few driving miles under my belt when I appeared for the next test. As a holder of the Learner's license, I was entitled to drive her car with the 'L' plates on. So I started driving her from 1 Clarkson Close to her office on Regent Street around ten in the morning. I would also get some practice parking her car. I really greatly valued this offer from her, as it helped me acquire confidence for driving. The next test, however, I narrowly failed. But encouraged by Mrs Clarke, I persisted and in my fourth attempt passed with flying colours.

Another highlight of our Cambridge life those days were the visits by Dr Arun Mahajani, who was at Huntingdon. He would come for a few hours, sometimes for an overnight visit, and would treat us to huge dinners in the local Indian or Chinese restaurants.

This period also saw our transition from the 'Hut' to better surroundings. A part of the old Metallurgy labs had burnt down and was to be rebuilt. Since

the labs did not need that space any more, it was available for other departments and George Batchelor put in a claim for DAMTP. It was granted by the university and so George could move us to more spacious surroundings. I was now sharing an office with two others. Although this allowed for more privacy, we missed the bonhomie of the large hall in the hut. Here I was joined by Brent Wilson from Christ Church, New Zealand. The third occupant was Chandra Wickramasinghe, who rarely visited the office and preferred to work from his room in College lodgings.

Having submitted my essay, I anxiously waited for the result to be announced before the end of the Easter Term. All professors from the Mathematics Faculty were on the board of adjudicators. I was aware that there were other very good research students from other fields who had also been in the competition. More Smith's prizes could be awarded, if the adjudicators so felt. There was also the Rayleigh Prize which was given to the essay that did not qualify for the Smith's Prize, but was otherwise the best amongst such essays. The last Indian to be awarded a Smith's Prize (in 1926) was Dr G.S. Mahajani, the father of Dr Arun Mahajani, whom I had got to know well since coming to Cambridge. In 1932 my father had received the Rayleigh Prize.

One fine morning in March when I walked into I Clarkson Close, for driving Mrs Clarke to her office in her car, I was engaged in a chat by Barbara. Amongst other day to day matters she suddenly mentioned that the other day she noticed that their cat Tattie was sitting on my Smith's Prize essay. She followed this remark by another: "You see, she likes only the best things to sit on."

I did not pay any great attention to this comment, but remembered it when I received a few days later, a letter from the Registry informing me that I had been amongst the three recipients of Smith's Prize. The announcement also appeared on the Senate House Notice Board. The other recipients were from statistics and pure mathematics. I also noticed that John Taylor, who had received the Mehyew Prize when I got the Tyson medal in Part III of the Tripos, had been the recipient of the Rayleigh Prize.

So I had made a good beginning with my research!

## FELLOW OF KING'S

My cable home announcing the award of Smith's Prize naturally evoked a very joyful response from my parents and Vasantmama. But there were many others who wrote or cabled their congratulations and I was simply overwhelmed by this reaction. It was pointed out that after the 1926 award to Dr G.S. Mahajani, it was in 1962 (note the reversal of the last two digits), that another Indian got this award. Dr Mahajani was of course delighted and I heard from him as well as from the doyen of all Cambridge educated Indian mathematicians Sir R.P. Paranjpye. When I met Dr Mahajani's son Arun in London next, he presented me with a very good tie. From the Tatas, I had letters from Mrs Vesugar, Captain Thompson and Mr Saklatwala, the Director of Tata Limited.

An example of how valuable the Smith's Prize is considered in the Cambridge college establishment, was brought home to me when at the High Table Dinner on the Tuesday following the award, The Censor Dr Grave called for silence to raise a toast to 'The first Smith's Prizeman that Fitzwilliam has produced'. He made a short speech to extol my achievements. I was deeply touched by this unusual gesture.

With my economic conditions improving, I felt that I could now indulge in the luxury of a car. I had a driver's license and so there was no bar on my driving if I could afford it. Barbara Hoyle and her mother Mrs Clarke had also been pressing me to buy a used car, saying that a good one could be obtained for £ 100-£ 200. They knew a very knowledgeable car mechanic called Ted Knott who worked in the local garage and occasionally drove the Hoyles to the

Heathrow Airport. They felt that Ted could look for a used but reliable car at a modest price.

And he did find one Vauxhall Velox, of 1953 vintage with gears on the steering wheel and a continuous front seat. It ran well and cost only £ 95. I bought it and brought it to 5 Collier Road, where I could park it not far from my lodgings. I also became a member of the AA, the Automobile Association. In retrospect, this turned out to be a wise decision.

For, one thing I discovered within a few days. The law required that I should keep the parking lights on during the dark hours if the car were parked in the street. I did so and within two days, the car battery ran dry. I could not start the car and called the AA to jump-start it. They had a free service for this purpose for members provided the car was not on the premises of the owner. I met these conditions since the car was not parked in my dwelling. This happened on a number of occasions. But I felt that I should reduce the drain on the battery since my day-time running was not enough to make up for the night-time loss of charge in the battery. I attached a special parking light which helped, but I was in need of a new location for my car which *did not* require night time parking lights at all.

A friendly research student told me that the Free School Lane that ran by the side of the Cavendish Labs was one such street. I began parking my car there...it was close to my place of work if not to my dwelling. There were no parking lights to drain the battery and my problem was over.

The car was extensively used by me for making short trips into the surrounding countryside with friends like Kumar Chitre, Jamal Islam and his wife Suraiya from East Pakistan, Chandra Wickramasinghe and his friend Rajendram, both from Sri Lanka, and of course, my brother Anant. On a sunny day it was a pleasure to go through small country roads and stop for English tea somewhere on the way. We also made trips to London, parking the car on the outskirts on the route A 10, usually in the car park of the underground station Arnos Grove. From there one could connect to any spot in central London without any difficulty. On one occasion, the Maharashtra Mandal in London honoured me in a small function, to which both Anant and I went in my car. The function was on a Saturday evening and afterwards we enjoyed the hospitality of a Maharashtrian lady, Mrs Tendulkar, who treated us to an excellent dinner and an equally delicious breakfast the next morning. I recall it as a very pleasant spring day and we drove back along the A 11, which was very sparsely crowded.

I also went to Oxford with Jamal and Suraiya and Anant on a day trip.

The journey each way took two and a quarter hours. Sunil Sinha from our Strathnaver connection was there with his Danish born wife Lonny and they entertained us to a meal besides showing us around Oxford. Of course, this was not my first trip to ‘the other place’, and on each occasion I returned with the impression that Cambridge was the ‘better place’.

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In early 1962, I took part in a hiking tour of the Lake District along with Fred Hoyle. This was to be the first of a number of such trips. It was, however, in the winter season and we were passing through a very cold spell. Hoyle had already gone ahead, and we four (Chandra, Rajendram or Raj, Anant and I) were to follow. Accommodation had been booked for us in the Old Dungeon Ghyll Hotel in the Great Langdale area. Chandra, who had once gone to this hotel with Fred on a similar hike was the only one amongst us who could claim to know the area. Chandra explained that there were *two* hotels in the area, the other being the New Dungeon Ghyll Hotel. However, the old hotel attracted the mountaineering and hiking community and had been their haunt for a long time. Sid Cross, the owner, was a great friend of Hoyle and entertained experienced mountaineers, some of whom had taken parts in the Himalayan expeditions.

Our travel to the hotel from Cambridge was, however, something of a nightmare. We travelled via London. The Euston station was in a state of chaos, as several trains had been cancelled, delayed or rerouted because of unusual snowfall. I was reminded of the description of Waterloo Station in the humorous book, *Three Men in a Boat*. While we waited at the platform, we could also watch some of the illuminations and celebrations for the New Year’s Day. Our train set off about a couple of hours late. As we got into a compartment, we saw that the seats were covered with snow! Presumably there was so much moisture inside that water had condensed into snow. We were told that with the heater full on, the situation would improve! Indeed, after bearing with the situation for half an hour or so we began to experience the comforts of heat. The snow inside melted and evaporated and we could manage some sleep in our sitting position. We changed trains at Carforth, Oxenholme, and Windermere and got down at Ambleside. We took a taxi to the old hotel, reaching there mid morning. We were ravenously hungry. Sid Cross gave us hot coffee and asked us whether we wanted to start our hiking soon, in which case he would arrange for some packed sandwiches. Fred, he explained, had

already set off and told him the track he was following that day, in case we wanted to follow him. We were, however, more in need of food and sleep and decided to take it easy that day. Certainly the delicious five course lunch that the hotel provided was much more attractive than the sandwiches!

The next morning we joined Fred on his hike of the day. We set off after a heavy English breakfast and packed lunches in our shoulder bags. It had snowed the night before and we had to find the track through snow. "Let us strike a path here", said Hoyle at one place on the road we were following and turned right into an unfriendly looking zone towards some hills. The snow covered slopes looked formidable and when Hoyle started up one of them, we lost nerve. Having followed him some way, only Raj, the sportsman amongst us stuck to his lead while the rest of us decided to go along some less daunting path. Gauging our abilities in this direction, Hoyle told us a simpler and shorter route to follow, which we did and did enjoy the trek. The simpler but substantial fare of packed sandwiches was also most welcome when we decided to have some rest around mid-day.

Our treks, sometimes with Fred Hoyle and on others without him (if he thought that his route was too tough for us) included walks to Ambleside, Grasmere, a climb of 2400 ft nearby and of Great Gable (2950 ft), visit to Skelwith, etc. The weather was mixed, some sunny days interspersed with rain and snow. But altogether it was an enjoyable week or so that we spent in the Lake District. Our return journey involved fewer changes: Fred dropped us at the Windermere station, where we caught the 9.25 a.m. train getting down at Bletchley from where we had a direct train to Cambridge.

The huge meals in the Old Dungeon Ghyll Hotel including sumptuous afternoon teas were responsible for each one of us putting on about half a stone of weight. For the rest of us it did not matter, except for a desire to shed the excess weight, but for Raj it was crucial. For, he was a serious contender for the Cambridge boxing team and the weight increase shifted him from the featherweight (boxing) class to the next one, the light heavyweight class. He needed to reduce fast and by reducing his eating to one meal a day managed to get back to his original class.

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I was passing through a very productive phase of research at this stage. Following my first paper with Fred Hoyle on the counting of radio sources, I had suggested to him that we might get a better feel for the predictions of our model if we did

what is today called a Monte Carlo calculation on a big computer. This involved placing random observers in different parts of a randomly generated universe and then letting them count the radio sources from their vantage points. Since our model had a inhomogeneity on the scale of a supercluster, the outcome of such a count very much depended on the location of the observer. So one first needed to ‘create’ a model universe on the computer and then to ‘place’ the observer.

The EDSAC computer at Cambridge, Hoyle felt, lacked the speed and storage capacity to do this calculation. With the research funds available to him from DSIR, he had already negotiated a deal with the IBM 7090 system in London for use of computer time. He had done so primarily for working on models of the interiors of stars and John Faulkner was going to be the main user. But John’s computer programme had not yet reached the stage where it could be tried on this machine and Fred encouraged me to use this facility. This meant typing the programme on punched cards, taking the deck to London where it would be handed over to the IBM programmers who would give the ‘listing’ which I would check and then if OK, ask them to run the programme on the computer. If there were errors of programming, they would to some extent be made known at the listing stage and I would correct them. The running of the programme would have to wait in a queue and the result would be available in the afternoon. Often, especially in the beginning of a new programme, there would be some logical errors that required corrections and I would need to come again the following day or the following week. Thus one needed to do trips to London to sort out relatively minor computer errors! I envy today’s research students who have a lap-top access to computing systems of far greater capacity.

However, after several attempts at debugging, my programme finally got going and it was a matter of putting in numbers for the parameters. I could go through the exercise several times and confirm that what we had estimated through an analytical approximation a year earlier was correct. This result was published by Hoyle and me in another paper in the Monthly Notices. I believe that this was the first ever computer simulation in cosmology using random numbers and Monte Carlo methods. [The name Monte Carlo comes from the casino in the city-state of that name where the roulette tables operate on a random basis.]

Following my experience of Varenna the previous year, I was looking for a meeting to attend on the Continent and found the poster advertising the International Conference of Relativistic Theories of Gravitation, [which later

became one of a series of International Conferences on General Relativity and Gravitation] to be held in Jablonna near Warsaw. I consulted Fred Hoyle about it and he informed me that I was probably too late as the participation in the conference was decided on a national basis and the Royal Society had already decided the contingent participating from Britain. I was disappointed by this lost opportunity since very distinguished relativists were expected to participate in this meeting. Nevertheless I applied to the relevant source and Fred Hoyle forwarded my application with a strong recommendation.

That must have worked, for, a few weeks later I received a positive reply from Hermann Bondi, who was leading the British contingent, informing me that my participation in the conference was approved and that I would receive a travel grant in the range of £ 50 -£ 60 from the Royal Society. Sure enough a cheque for £52. 10s arrived from the Royal Society well in advance of my travel dates with a promise of a further £ 5 after the return from the meeting. Fitzwilliam House, generous as ever, also gave me a bursary of £ 20. So I was well provided for the conference including an excursion into the southern part of Poland arranged by the Conference organizers. I applied for the Polish visa, an exercise that involved considerable bureaucratic delays characteristic of the countries beyond the iron curtain.

Nevertheless, all formalities completed in time I set off via Harwich and the Hook of Holland, my train going through West Germany, then through East Germany including the divided city of Berlin into Poland. The journey was long with various types of experiences, of which I recall most the several checks made on the passengers in East Germany. From Warsaw station, the organizers had arranged transport to the country house in Jablonna where all delegates were accommodated.

That was indeed a very pleasant place to live in, if somewhat isolated from any distractions that abound in a typical Western city. I had arrived in the late evening and the following day was the day before the conference began. Being a free day I took a walk in the premises in the sunny afternoon and the premises reminded me of descriptions of aristocratic houses in various historical novels. In the communist regime there were, of course, no aristocrats and such houses were state owned and let out to conferences like the one I was attending.

The conference itself was well programmed and the list of speakers read like Who's Who in Relativity. There were people like Synge, Fock, Dirac, Feynman, Ivanenko, Petrov, Wheeler, Møller, McCrea, Bondi, Schild, Dicke, Infeld, etc. whose names I had come across in relativity textbooks. It was a thrilling experience for me to see them in flesh and blood and to talk to some

of them. I used my newly acquired 8-mm movie camera to take some shots of them discussing with each other. Many of them remembered or knew the work of my father and enquired about him, some of them mistaking me for him! I was allowed to present my work in a 15-minute contributed talk and I spoke on my work on neutrinos. It generated enough interest to encourage me greatly in proceeding further along that path.

At this meeting, I met for the first time S. Chandrasekhar, who had been a contemporary of my father at Cambridge and whose work on white dwarfs had generated a great deal of interest in the 1930s and for which he was later awarded a Nobel Prize in 1983. I first ran into him in the gardens of our country house one morning as I was taking a pre-breakfast walk. We introduced ourselves and he was pleased to learn that I was the son of his contemporary in Cambridge. He asked me to convey his compliments to my father. Even though he had a reserved personality, he opened out enough to share with me his motivation in attending this meeting: he had never worked in this field, but was now keen to start and wished to know what areas were considered promising for research! I was struck by this attitude from someone who was over fifty in age, wanting to start research in a new area. Later, when we visited Krakow and Zakopane on the Conference excursion, we were sharing a room to stay. He invited me to visit him in Yerkes Observatory near Chicago, whenever I came to the USA and had some time to spare. I had an occasion to make use of this invitation early in 1964.

My trip back to Cambridge was uneventful, except the circumstance that in the train from Warsaw to Hook of Holland there was no provision for food and I was starving when I reached Hook of Holland where I could buy some snacks.

There was a memorable occasion arising out of this historic meeting. Fifty years later, in the year 2012, the Polish establishment organized another relativity meeting to which they invited the survivors of the 1962 conference. I was amongst the dozen or so survivors and for me the meeting was indeed something to cherish. I showed some of the photographs I had taken in 1962 which showed different participants. They were seen with great interest in 2012.

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Both Anant and I were eagerly waiting for the visit of Vasantmama and Prabhramami, who were travelling to Ames, Iowa for a two-year visit to the

Iowa State University. They had allowed a few days halt en-route to New York, to see London and Cambridge. For Vasantmama it was revisiting places last seen thirteen years back while for Prabhramami it was her very first visit abroad.

The day (25<sup>th</sup> August) that they were to land in London, Anant and I drove up in my Vauxhall Velox. We left in the morning and parked in Arnos Grove and went to Pathak's grocery store to buy some Indian groceries then not available in Cambridge, and to Agra Club restaurant which specialized (curiously enough!) in South Indian cuisine. We had dosas there and then went to central London to book our accommodation in the Royal Hotel for the 30<sup>th</sup> August when our guests were to pass through London for their flight to New York. We returned to Arnos Grove and drove from there to Heathrow. The flight landed about 45 minutes late and at 9.30 p.m. they came out of the arrivals area. We drove back to Cambridge and reached home in about two and a quarter hours. They were to stay at 5 Collier Road and it was 1 a.m. by the time we all went to bed after some snacks.

Barbara Hoyle invited all of us to tea the next afternoon and Fred invited Vasantmama to the St Johns High Table for dinner the following day. He quite enjoyed the food which he found to be of very high quality. He met mathematicians Dirac and Mordell also. During their brief stay they were invited by the Lapwoods and also by Mr Thatcher, who had been Censor of Fitzwilliam when Vasantmama was a student there. The Jeffreys were not in Cambridge, otherwise they would also have been pleased to meet them. A trip to Grantchester with tea at the Orchard was also part of their sightseeing as well as punting on the Cam.

On the way back to London we went to the India House cafeteria for lunch, expecting to run into Sadanand Agashe, the son of Professor Agashe, a great friend of my father. Indeed Anant and I knew Sadanand from our childhood days. We knew that he was also passing through London but did not know whereabouts he was staying. Guessing that the India House cafeteria would attract him, we had gone there. Our guess was right and we did find him there!

We then went to see the Tower of London and some other landmarks of London. We also dropped in on the Deshmukh family. Ram Deshmukh, the youngest brother of the distinguished scholar and administrator, C.D. Deshmukh had been a contemporary of my uncle in Cambridge and was pleased to meet him again after many years. I came to know Ram very well in later years both in the UK and in India.

As all good things come to an end sooner or later, the visit of Vasantmama

and Prabhamami came to an end when we saw them off at Heathrow the next morning. Their flight was delayed but they eventually got off and we came back to Cambridge feeling slightly homesick!

\* \* \*

The Royal Astronomical Society holds one of its meetings outside its campus, in some well known astronomy centre elsewhere in the UK. In 1962, this outstation meeting was in Belfast and Chandra, Kumar and I decided to attend it. We also decided to couple it with a tour round the entire island, North as well as South. Raj was also persuaded to join us. I offered to drive all of us in my car from Cambridge to Liverpool from where we intended to take the overnight ferry crossing after leaving the car in some safe garage. After the RAS meeting we planned to rent a car and do our tour for about a week.

The car behaved well in taking us to Liverpool where we parked it in a dockside garage for 11 days. We then took the night ferry to Belfast. As we had booked dormitory accommodation, we could get good sleep and were fresh when we landed in Belfast. Our accommodation was in Queen's Elms, near the Queen's University and we duly took possession of our rooms. The RAS meeting was for two days but we spent altogether four days in Belfast before setting off on our journey. Chandra and I were the drivers and we took the northern route, the Anterim Coast Road hugging the East coast. Stopping at the Giant's Causeway enroute, we reached Londonderry in the late afternoon. From thereon we crossed the border into the Southern Ireland or Eire. Although we were entering a country other than the UK, the border formalities were very informal. The situation was to change, unfortunately in the late 1960s when the IRA and other countering extremist organizations got going, leading to disturbances that were to last for four decades. We caught no whiff of that divisive feeling in our very peaceful trip through the Irish countryside. We stayed the night in a bed and breakfast place in a small village called Raphoe not far from the border.

We had a curious experience the next morning...our car would not start. It finally did when we gave it a push from behind. Since we had done good running the previous day and there was no drain on the battery through overnight parking lights, we had not expected the battery to run down. In fact we found this to happen every morning and got used to parking the car overnight on a downward slope to ease its starting.

We travelled southwards along the West coast, going through Donegal,

Sligo, Galway and Limerick stopping overnight at Limerick. The next morning we drove along the river Shannon through beautiful country, reaching Killarney where we stayed in a farm house. We were treated to an enormous breakfast with lot of home baked bread and cakes besides the usual bacon and eggs. We spent the day touring landmarks near Killarney, like the Ross Castle, the Ring of Kerry, Tore Waterfall, etc. The weather was a mix of sunshine and pouring rain and often we found ourselves driving through clouds.

After Killarney we went to Dublin visiting on our way the Blarney Castle with its famous Blarney Stone, the 'stone of eloquence'. Doing sight-seeing round Dublin, we made our way back to Belfast. In Dublin, I had a somewhat harrowing experience, which in retrospect I find amusing. We were passing through a heavy traffic jam through the famous O'Connell Place. I was driving and Raj was in the front seat giving instructions on the route to follow. I was at the head of the rightmost lane of a four-lane traffic, when Raj suddenly pointed to the lane on the left which we were supposed to take. As soon as we were cleared to go by the traffic policeman, I stepped on the accelerator and moved across the three lanes on my left. I did clear the lanes, although it was an unwise thing to do and I was sure enough pulled up by the traffic cop. He asked to see my license and seeing that it was British, gave it back without endorsement. But he gave me a lecture in no uncertain terms. What amused me later was the fact that part of the lecture was directed at the British, commenting on their standard of driving if persons like me could get licenses there.

We returned the car with the complaint that it always gave trouble starting the first time in the morning. We had a booking on the Belfast-Liverpool ferry in first class and so had a very comfortable crossing. The car from the garage was collected and it took us back to Cambridge without any problem.

\* \* \*

Fitzwilliam House expressed further confidence in my abilities by making me the Director of Studies in mathematics. With the start of the Michaelmas term, my duties as Director of Studies began with finding supervisions for undergraduates studying the maths tripos. This done, I felt relieved and could attend to my own supervisees. As Fred Hoyle had gone out of Cambridge for the term, I was placed under the supervision of Dennis Sciama, a cosmologist of Italian origin but who was brought up in Britain and so spoke English like the native. We had discussions on my work and he was particularly interested

in the Wheeler-Feynman theory. He was at the time a strong supporter of the steady state theory, a position he was to abandon three years hence. His wife Lydia was also Italian and I recall having some Italian delicacies at dinner in their house.

Dr Srivastava from Agra had joined Peterhouse to do research in chemistry and so he and Anant got to know each other well and we three often went out to walks in the countryside or for rides in my car. He named the car ‘Varanasi Express’. I also met two new Tata Scholars, DasGupta and Ranganathan.

Raj won his match against his boxing counterpart from Oxford, in the inter-varsity competition. As he was part of the Cambridge team against Oxford, he had received his Cambridge blue and was also made a member of the prestigious Hawkes Club. Only full blues were entitled to membership of this club. To celebrate his victory, Raj invited Anant and me to lunch there.

The new term saw new set of research students at the DAMTP, the total number now reaching 25. The Department gave a party to all research students and it was also an occasion to get to know the new students.

I visited London on several occasions, sometimes for work and sometimes for social visits. The former were when several of us students went to attend lectures or seminars at the Royal Society or the Royal Astronomical Society which faced each other across Burlington House in Piccadilly. The social occasions were when we went to meet friends like Arun Mahajani or saw some play in a London theatre. The Mermaid theatre that had recently come up on the south bank of the Thames, had several interesting experiments in the theatre. I had seen there the play by Fred entitled *Rockets in Ursa Major* which he had begun writing in Zermatt the year previously. The play had been written for schoolchildren and was staged during the Easter vacation. The owner of the theatre, Bernard Miles, a well known actor was a good friend of Fred Hoyle.

I was also writing drafts of papers based on my work which I used to send to Fred for perusal. After his modifications I sent the papers for publication to either the MNRAS or to the Proceedings of the Royal Society. I had begun to get some confidence in writing papers now.

Anant and I regularly visited the Lapwoods, the Thatchers and the Cunninghams for tea or high tea. Chandra and I were also invited to 1 Clarkson Close for dinner or for afternoon tea. Gram’s scones were an attraction at the tea whereas there would be some new dish tried at dinner. Once Chandra cooked ‘Ceylon Chicken’ for us in the Hoyle kitchen.

I used the Michaelmas term to prepare a Fellowship dissertation which would eventually become my Ph.D. thesis. This was needed for my applications

to King's, St John's and Peterhouse for a research fellowship. Hoyle and Bondi were my referees. The King's decision was expected first, although I had been shortlisted in all three colleges.

In November we began receiving disturbing accounts of the border war between India and China. To those of us who had left the country in the 'Hindi-Chini Bhai-Bhai' season, the severity of the conflict came as a shock and the debacles suffered by the ill-prepared Indian forces were tragic. There was support for India in the Western media and it was a relief when the active conflict ended with a ceasefire. I recall being in London with Arun Mahajani and some of his Indian doctor colleagues, when we entered a pub and requested the barman to put on the BBC TV channel on which Nehru was being interviewed. Nehru appeared a shadow of his normal debonair self and clearly the event had taken much out of him.

A tragic event that affected me and Kumar Chitre a great deal occurred in early December when we learnt that Peter Lapwood, the eldest son of Dr Lapwood, was killed when his bicycle collided with a car. We never got the details right, but it seemed that Peter had fallen down on a track already made slippery by snow and when he was attempting to get up, he collided with an oncoming car. Anyway we called on Dr Lapwood in his rooms in Emmanuel and were struck by the calmness he displayed. We did not know what to say to the bereaved parent of a boy of very promising career but felt some comfort in simply being with him for a while.

\* \* \*

That winter was a very severe one, getting the statisticians search into the record books. The river Cam froze and there were people skating on it. In some places, though, it was literally skating on thin ice, for, some skaters fell into the water underneath when the surface plate of ice cracked. Still, it was a worthwhile adventure for the enthusiasts.

At Fitzwilliam, there was a special party on December 15, to celebrate the passing of the Third and Final Report of the Council of Senate which was to change the nature of Fitzwilliam House for ever. At the time it was a non-residential institution set up by the Non-Collegiate Students' Board in the previous century to cater to the poorer, and overseas students. After the passing of the Report by the University, way was open for Fitzwilliam to become a full-fledged College. The University had already allocated to it funds and more importantly, land for its residential buildings. These were on Huntingdon

Road, and the well known architect, Sir Denys Lasdun had produced plans for them. In fact, work was already started on the first phase of the buildings. With the Senate decision, the institution could start by appointing twenty four fellows.

In the closing days of 1962, Anant and I were invited to Merthyr Tydfil in South Wales by Arun Mahajani who was working as Registrar in the Merthyr General Hospital. We had taken a bus from Cambridge to Merthyr Tydfil, which required one change. This was a comfortable, if a rather slow journey, since motorways were still to come to Britain. However, we reached in the evening, well after dark and were able to make our way to the Hospital where Arun met us and took us to our guest rooms.

It was very cold in the town and inside the house where we were to stay. Although there were gas fires, they were woefully inadequate as room heaters. To warm us up, Arun ran hot water into the bathtub, another rather feeble attempt at bathroom heating. But, after a hearty meal we felt much better and could warm ourselves by getting under layers of blankets.

As a town Merthyr had not much to offer by way of sight seeing. Being a mining town it was rather drab, but had pleasant countryside and we enjoyed the visits to neighbouring places like Aberdare or Cardiff by train or bus. We also went to Barry Island and called on Dr and Mrs Hardikar there. Sharad Hardikar was, like Arun, practising in the UK and working for the FRCS, specializing in orthopaedics. We were treated to an excellent Maharashtrian meal in chez Hardikar, thanks to the cuisine produced by Leelatai Hardikar. I recall that after the meal Dr and Mrs Hardikar drove us three (Arun, Anant and me) back to Merthyr Tydfil on a freezing foggy night, through winding roads. After dropping us, he and Leelatai made the same journey back to their house in Barry Island. I did not envy them the hazardous driving both ways.

Memories of a very cold day also are associated with our trip to Swansea on the south coast. It was almost completely rebuilt after the wartime bombing. We walked on the main seaside road and after some fifty metres or so felt so cold that we had to enter a shop to warm up. The shop had a sale on and Arun could pick up some bargains!

On our way back we took the train from Cardiff to London and found that it was so crowded that we had to stand for an hour or so. The rush was because many trains had been cancelled because of the cold wave. We managed to reach Cambridge quite late.

A shock awaited me on my return. In the morning, when I went past the Free School Lane on my way to my office, I found that my car was missing! It was not parked in its usual spot, nor was it to be seen nearby. I consulted my

friends in the Department. They advised contacting the Police, who may have removed it for some reason. With some trepidation I called in at the St Andrews Street Police Station expecting to pay some fine in case I had violated some parking rule. The Police, after listening to my story and checking their records came back with the following verdict: "Sir, we did not remove your vehicle and so someone else has. We will look for it as a case of stolen car."

They took down the number and other details of my car and promised to contact me as soon as they located the car. I came back relieved that I had not committed any offence but worried as to the success in locating the car.

I need not have worried. By lunch time the Police rang up to report success. They had located the car abandoned on a country road some ten miles from Cambridge. The car battery was flat and so I would need help in jump-starting it, they warned. Sure enough when a fellow graduate student took me in his car to the spot, the car was there, undamaged except for its usual complaint : a flat battery. The explanation of the episode as surmised by the Police was that on weekends there are visitors from outside attending parties and some are tempted to take cars apparently not much in use, for a joyride.

\* \* \*

In January, Fitzwilliam House offered me their fellowship. It was a great honour being one of the first fellows to be elected at one's *alma mater*. However, I had already applied to some colleges for research fellowship and wanted to spend the next few years doing research only. Also, having so far had no experience of staying in an old college, I very much wanted to become fellow of one. At Fitzwilliam, I would have got a teaching fellowship with commitments like supervisions and directing studies. I therefore had a talk with the Censor Dr Grave to explain my position and conveying my reluctance in accepting the honour. He was very good about it and understood my reasons for declining the offer.

I had already received a call for an interview at King's on the 31<sup>st</sup> of January. There were 5-6 short-listed candidates like me and all of us were invited to a sumptuous lunch before being asked to talk on our work. I was the first to be called and saw a committee of Fellowship Electors. There were altogether around 8-10 fellows belonging to different disciplines. None belonged to cosmology or astronomy, my chosen field. I was therefore asked to describe my work in a way that they could understand it. This was tall order, but as I had given a couple of talks to undergraduate societies on my work, I had some

practice. The time allotted was around twenty minutes and I had no access to a blackboard. However, I must have done a reasonable job so far as I could judge from their responses and questions.

I was free to leave after my interview and did so. The next morning I received by post a letter from the Provost of King's, Noel Annan, a letter inviting me to be a Berry-Ramsey Fellow of King's. Assuming that I would accept the offer, the formal admission to Fellowship would take place in a short ceremony in the Chapel on February 6. I immediately wrote accepting the offer. Of the four prestigious external research fellowships at King's the Berry Ramsey Fellowship, named after James Berry and Frank Ramsey, two former fellows who were no more, was for scientists. Being a Fellow of a College founded by King Henry VI was a signal honour, for amongst the Cambridge colleges, King's enjoyed the first priority, being the oldest royal foundation.

In Cambridge reckoning, I had arrived!

## A DON'S LIFE

THE Provost's letter had mentioned that there would be an admission ceremony in the chapel, the very same chapel that by its magnificence attracted tourists from all over the world. I had been one of those tourists when I had last gone into the chapel. Little did I imagine at the time that one day I would be part of the community to whom the chapel belongs.

That evening the short ceremony began at 7 p.m., with the Provost sitting in his grand chair. I read a declaration as earlier informed by the Chief Clerk who had briefed me on how the procedure would go. Then I kneeled before the Provost, holding out my hands with palms together. He held them in his hands, like the Vice-Chancellor does when awarding the degree, and recited a statement in Latin, admitting me to the Fellowship. He made one change as I was not a Christian by religion: instead of admitting me in the name of 'the Father, the Son, and the Holy Ghost' he admitted me in the name of 'God'. I then signed a register in the presence of all Fellows, who had lined up so that I would be introduced to them. I was also given some books about the statutes and history of the College.

After the brief ceremony in the Chapel, we all moved to the Provost's Lodge for drinks. Noel Annan had known that I did not consume alcohol and so had a glass of orange juice waiting for me. In the Hall which I now entered after him leading a procession of all Fellows present, there was the College grace. It was read by the Provost after which we all sat down at the High Table. As the number of Fellows attending this rather special day was large, the small

table behind the large High Table was also occupied by the Fellows. The Provost sat in the middle of the long side, facing the large body of students dining on the low tables. I sat to the right of the Provost, while the Vice-provost sat on the opposite side facing him. The seat on my right was known as the ‘starvation corner’ as the person sitting there would be served last, although the person in my place would be the first to be served after the Provost or the Head of the Table. An old gentleman sat to the left of the Vice Provost, thus directly opposite me. He was introduced to me as E.M. Forster. Thus I was facing the famous novelist and essayist, whose novel *A Passage to India* was known to be a masterpiece.

I recalled that only a few months back, I was sitting on the banks of Cam where the King’s lawns meet the river. This side was open to the public to sit on and I was accompanied by an Indian friend. As we were watching the leisurely traffic of punts on the river, my friend suddenly turned round and pointed to an elderly figure slowly moving across the vast lawn. Since walking on the lawns of a College is a privilege extended to Fellows and other senior members of the College, I knew that this elderly gentleman must be a Fellow of King’s. My friend knew more than I did, for he said that that was the legendary E.M. Forster. Little did I guess at the time that I would be sitting across the dining table from him, and would shortly afterwards have him as a neighbour.

During the dinner conversation, Forster learnt that I was born in Kolhapur and that immediately bridged any invisible gap separating us. For, Forster knew Kolhapur well as a sister state of Dewas in Madhya Pradesh, where he had spent a year or so as Private Secretary to the Maharajah of Dewas back in 1921. That was when the British Raj was at its zenith and the influence of the Raj in the princely states like Dewas or Kolhapur was well felt. In his autobiographical account of the Dewas tenure, Forster graphically describes the undercurrents of intrigue and protocol of such a state. Dewas and Kolhapur were linked through a royal wedding that did not lead to a successful marriage, although their dynastic linkages continued.

On that wintry evening at the High Table, that remote link with his life in India must have seemed to have come closer with me sitting across and he shed his customary reserve and asked me a number of questions about Kolhapur, my parents and me. Our chat continued when we moved to the ‘Wine Room’ where the Fellows enjoyed wine and dessert, the wines being port, Madeira and claret, all in three flasks moving on a silver trolley. There were two such trolleys and they gradually went round the table. The dessert included cheeses,

dry fruit and fresh fruit. These followed the main menu (which was of four courses ending with some sweet dish) at the High Table. All in all, the Fellows did themselves well and I was encountering for the first time glimpses of the kind of dinner I had read about in P.G. Wodehouse novels on life in the stately homes of England.

The festivities were over by about 10 p.m. and I walked home to 5 Collier Road, planning for the future. I was to meet the Vice Provost the next day to sort out various details, including where in College I would be staying. But my days in the digs were numbered.

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That was indeed the case as the next day the Vice Provost suggested that I move into a temporary guest room in the celebrated Gibbs Building of the College and wait till some more permanent apartment could be found. On the 8<sup>th</sup> of February, Anant helped me in moving my things round from 5 Collier Road to the Guest Room. In about a week's time I moved to the Old Lodge, the former residence of the Provost, later converted as part of the Keynes Library and then used as a set of three apartments on the first floor. My apartment consisted of a sitting room and a bedroom with a bathroom nearby for my exclusive use. My neighbours were Tim Munby and George Rylands, both Fellows of long tenure, of which George lived in College but Tim, being married, lived out. In Cambridge colleges, married fellows lived out in their own houses.

Subsequently, I was offered another apartment on the first floor of the A-staircase, A4 to be precise. This consisted of a huge sitting room and an equally huge bedroom with windows looking out on to the Chapel and the front lawn. The attached bathroom had a curious geography! It was shared with the occupant of A3 and so had two entrances, one from each apartment. It also had an external entrance from the back with a staircase of its own. So the user of the bathroom had to ensure that all the doors were closed when the bathroom was in use and open when it was not in use. The occupant of A3 was E.M. Forster.

I learnt from the Vice Provost who arranges all accommodation for Fellows, that the suggestion of offering A4 to me came from Forster himself. The apartment had a prime location, had a stunning view of the Chapel and was very comfortable. The occupant had a minor duty attached to take care of. There was an emergency bell connecting to Forster's bedroom; if he rang the

bell he needed urgent medical attention. He was then 84 years old and had occasional fits. However, throughout my stay there, I never had a chance to take action as no need arose for Forster to ring the bell.

I was deeply touched with the gesture by which Forster had indicated that he preferred me as a neighbour. Being of a reserved nature, he did not seek out company as a rule. So this gesture was very important to me. I got to know him better, as we often shared afternoon tea. He asked me to call him by his first name, *Morgan*. I did so with some hesitation as he was more than three times as old as I was then.

Another Fellow whom I got to know well was George Salt, an entomologist. He was a senior person of great reputation, a Fellow of the Royal Society and, although a ‘pukkah’ Englishman, interested in foreigners. He and I often sat next to each other in the wine room and, having been to Pakistan once, he wanted to know more about India. He had beautiful calligraphic handwriting and was interested in various scripts from all over the world. He had an artistic bend and showed me beautiful water colours of flowers and butterflies. His wife Joyce was very hospitable and there were many meals and teas that I enjoyed at the Salt house.

My fellowship was named after Berry and Ramsey. The latter was Frank Ramsey a distinguished philosopher who died young. His father was A.S. Ramsey, mathematician, whose textbooks I had used both in India and in Cambridge. His younger brother was then the Archbishop of Canterbury. The College needed an official photograph of me for its Fellows’ album and I was asked to get it done by the famous Cambridge photographic firm Ramsey and Muspratt. Frank Ramsey’s widow was the co-owner of the business.

A taste of privilege that I could now enjoy (apart from dining on the High Table and walking on the lawns) was to be able to roam round the streets of Cambridge without a gown after dusk! I was stopped a couple of times by the Proctor and his ‘bull dogs’. When I explained that I was a Fellow, they bowed and doffed their hats and politely moved away.

Another facility available to a Fellow was arranging dinner or lunch parties in his college rooms. I was able to invite friends for dinners with menus selected by me. These included John Faulkner, Ken Griffiths, Kumar Chitre, Jamal and Suraiya Islam, Gavin Wraith and his mother Mary Wraith, etc. I should mention that Gavin was a contemporary research student from Trinity who was researching in particle physics. He was a great friend of Jamal and I came to know him through Jamal. His mother, Mary Wraith, after her divorce came to live in Cambridge from the Lake District. She often invited us students to

her cottage for evening (after-dinner) coffee and chat. I came to know other young students in Cambridge this way.

As the 'junior-most' fellow, that is fellow most recently elected, I enjoyed another privilege, although I did not use it: after the wine room dessert and wine session, the wines left in the flask were given to the junior-most fellow to take home. As I did not drink, I surrendered this privilege to the next junior fellow present.

Also, there were six feasts distributed round the year to three of which I could invite guests. The first guest I so invited was Mr S.D. Deshmukh or, Ramrao, as I used to call him. Himself a Kingsman, he was delighted to come for the Lent Term feast. The typical feast had some 6-7 courses and select wines to go with the food. Dinner dress was worn; for the Audit Feast, doctors were asked to wear scarlet on their gowns. One feast, in July, was for lady guests and I was hoping to invite my parents as guests for it. Their visit was now expected to take place around July of 1963.

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With having a stable academic position in Cambridge, I felt that a visit by my parents would now be opportune. If they could time it in June/July, there was a good chance of my completing my thesis and actually getting the degree in their presence. In addition, Anant was making good progress with his Ph.D. and so both of us would be around to be with them if they came during the summer of 1963.

My correspondence with them shows that they had to work a lot on getting all paperwork done for such a visit. Being in Government service (as Chairman, Rajasthan Public Service Commission) my father needed leave sanctioned by the state of Rajasthan. Both my parents needed passports and my own experience in 1957 had indicated that getting one could be a long drawn out affair. In addition their passage by sea or air could not be booked unless the P-form, i.e., the Foreign Exchange Permit was issued by the Reserve Bank of India. These formalities were taking their own time, although Ramrao helped a lot by writing to the Reserve Bank of India. His letter may have helped in the P-form coming in time. The passports also arrived well before their expected date of departure. My father applied for six weeks leave and got it. Later it was discovered that the leave cut into his contracted period of five years, although he should have been entitled to earned leave. This resulted in a reduction of his pension. This reduction could have been avoided by him

appealing to the Governor; but my father did not wish to be under anyone's obligation and so did not do so. In fact his rectitude was much admired and the standards of integrity that he had set up remained unequalled.

As I was writing to them to set their dates, another variable entered the equation. I received an invitation from Tommy Gold for attending a unique conference in the United States.

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Tommy Gold was the youngest of the trio Hoyle, Bondi and Gold who in 1948, had proposed the steady state model of the universe. He was a senior professor in Cornell University, Ithaca in the state of New York. In the month of May, 1963, he and Hermann Bondi decided to organize a small 'round-the table' conference on the *Nature of Time*. This was focussed on the scientific and philosophical questions of what time is and why it appears to flow in one direction only...from past towards future. (By contrast, we can traverse space both ways, from left to right as well as right to left, top to bottom as well as from bottom to top, etc.) I was amongst some 15 invitees, all of them, excepting myself, distinguished physicists like Fred Hoyle, John Wheeler, Richard Feynman, Philip Morrison, Subrahmanyam Chandrasekhar, Dennis Sciama, etc. Grunbaum from Pittsburgh, a philosopher of science had also been invited. All of the invitees were to be paid first class air fare and provided with local hospitality.

Fred encouraged me to attend and even wrote to his friend Willy Fowler to invite me to Caltech. Fowler cordially extended an invitation, offering local hospitality and return travel from New York to Los Angeles. At first I was hesitant as to whether I should go as far as California when my parents were due to visit in the third week of June. After consulting them, I finally arranged to be back in Cambridge on June 17 so that Anant and I could travel to Heathrow to receive our parents arriving on June 19. This gave me around two weeks at Caltech, soon after the Cornell meeting.

There was another important event to take place around this time. I had submitted my thesis for examination and the names of the examiners were announced: Hermann Bondi and Dennis Sciama. Both were to attend the Cornell meeting and so they suggested conducting my *viva-voce* examination at Cornell. Cambridge University agreed to this rather unusual procedure on condition that there would be no financial burden on the University because of this arrangement. There was now real hope that with my viva held in late

May, the result could be decided by the Faculty of Mathematics in time for a University Congregation in early August where I could get my degree. As the dates of university congregations are arranged well in advance, I was advised by the Board of Graduate Studies that my degree could be awarded on the congregation scheduled on August 3 provided all formalities were completed in time. Fortunately the Chairman of the Mathematics Faculty was Dr Lapwood, who promised to help. Accordingly I arranged for my parents to be in Cambridge at least till that date.

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The visit to the United States, my first ever, remains in my memory as a very happy experience. A Pan Am flight brought me into New York's Idlewild Airport in the early afternoon of May 24. I was to stay with the Dilwalis for a few days and see New York, before flying to Ithaca. Although Charat Dilwali had given me elaborate instructions on how to take a taxi from the airport to their apartment in Jamaica, Queens, the need did not arise. Yashoda Dilwali had come to receive me along with a Pakistani friend of hers called Bilkis. The ladies spotted me from their location in the Visitors Gallery and came over to the baggage belts. Yashoda drove us from the airport to Queens. This was my first view of a real motorway...and I was quite impressed by the fast but disciplined traffic. However, Yashoda was eager to welcome me and so she took on driving to the airport for the first time! On the way back, she missed the Main Street exit and came out on the next exit. After a slight detour, however, we made it home without any problem.

The Dilwalis gave me a very good first view of the great metropolis. We 'did' the major attractions like the Empire State Building (the World Trade Centre twin towers were not in existence then), Radio City Music Hall, Wall Street, Times Square, Statue of Liberty, etc. As Charat worked in the United Nations, I could also get an 'insider's view' of the great organization.

The Cornell meeting was a memorable experience. Unlike the lecture-hall style, the arrangement was for us to sit around a long table and speak from where we sat. There was a blackboard for the speaker presenting a paper. Tommy mentioned in his introductory remarks that he was going to tape record the discussion so that it would appear in the proceedings of the meeting, apart from the papers presented. At this Feynman objected in his usual vigorous way saying that he felt that if his comments were to be recorded, he would refrain from making them...for, he argued that the comments he might make

could well be ‘silly’, but would have the merit of being uninhibited. Other participants felt, however, that even silly comments by a person of Feynman’s calibre were worth taking seriously. Finally a via media was reached with Feynman’s name not appearing in the proceedings, being replaced by ‘Mr X’!

The meeting was very well conducted and I enjoyed giving account of my work with Fred on the Wheeler-Feynman electrodynamics in the expanding universe. Hogarth and Sciama also spoke on the same problem giving their points of view. There were many lively interventions, not the least of them being from Mr X.

It was on the day, after I had spoken that Bondi and Sciama scheduled my viva, after the lunch was over, and before the afternoon session was to begin. This gave us only fifteen minutes, I pointed out. “That is five minutes more than we need” replied Sciama. Sure enough, the viva lasted some 7-8 minutes after I answered the 2-3 questions posed by the examiners. They argued that I had made a presentation at the conference that would serve in lieu of a viva and I had replied to the the questions (by Mr X and others) well and so no more time was needed for the viva. I was dismissed after being congratulated for passing the test. I left them writing their report as they sipped the post-lunch coffee.

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After Cornell, Fred and I were due to go to Caltech. However, Alfred Schild whom we had met in the Varenna summer school, invited Fred and me to spend two days at the University of Texas at Austin on the way to Caltech. We agreed and he arranged a couple of seminars by both of us. I spoke on the rotating universes and it was good to have Schücking present since part of the work related to his paper with Heckmann. Austin looked rather simple and empty compared to the busy New York. However, we were soon to see another bustling metropolis as we flew into Los Angeles.

Like New York, LA also left a deep impression on me as a first comer, a city that looked futuristic with its network of freeways and huge department stores, Disneyland and Hollywood and observatory at 5700 ft, like Mount Wilson. I got a chance to ‘do’ these tourism-highlights besides doing science. I recall having a late night dinner in Hollywood when the local life was in full swing and I saw a decked up and illuminated train going through the main boulevard. Willy, who was a train-fan was as thrilled as I by the sight, and said: “Jayant, I had it ordered specially for you!”

The science itself was also vigorous as we had a three-hour session with the Burbidges, Geoffrey and Margaret who had come over from La Jolla, Fred, Willy and Richard Feynman. Feynman gave us some fresh insights into the creation field theory, that Fred and I were working on. I came away from the session considerably invigorated.

My flight back from LA to New York was direct and brought me over the Grand Canyon which I could see from my plane window. Unlike the situation in India where aerial photography is forbidden, the pilot here announced advising the camera setting for taking a good picture! The Dilwalis were at the airport to bring me home. I had a flight scheduled from Newark to Heathrow in the morning of June 17. However, when I called to reconfirm my flight I was told that there was no such flight in existence. At this stage Charat took over and had a long talk with the Pan Am representative telling them that the ticket issued by them had this flight and if they had goofed they had better take me first class on another flight. They finally agreed to take me on the evening flight from Idlewild on June 16. So I found myself having to pack my belongings at the last moment! In a way this mistake on the part of Pan Am worked out in my favour since it gave me some extra time to get settled in Cambridge before leaving for London on the 19<sup>th</sup> morning to receive my parents.

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Anant and I had booked a room with breakfast for our parents at 55 Trumpington Street, appropriately located midway between Peterhouse and King's. The landlady was very friendly and promised to give breakfast as needed by my diabetic father. On the 19<sup>th</sup> morning we went by train to London. I had already sold my car since I did not feel the need for it, living so central as King's. I was to buy a new car only after I got married three years later.

The plane was on time and we were delighted to see our parents, Anant after two years and I after three. They were game for a little trip round central London before catching the train for Cambridge. We kept the bags in left luggage at King's Cross and visited the Piccadilly Circus. The weather was typical English summer weather: sunny with some showers. To have some sit-down rest we went to see a circarama film in the Leicester Square area. I believe, it was titled : *How the West was won*. The journey back to Cambridge was comfortable.

For my father this was a return after thirty one years. In the summer of 1932 he had left Cambridge with the intention of coming back to work on his

Isaac Newton studentship. He was also due to spend a year or so at Caltech, at the Mount Wilson Observatory. However, in India he met Malaviyaji at the B.H.U. and accepted a job there and did not go back to Cambridge. Now he was visiting after more than three decades. I was curious to see how he would find the university town after a gap of so many years. He would no doubt meet several persons he knew before, like W.S. Thatcher, Censor in his time, E. Cunningham whose lectures he had attended, Sir Harold and Lady Jeffreys, and Dr Lapwood. All of them were expecting to meet him and had already issued invitations to lunch, dinner or tea as convenient. Dr Grave wanted to invite him to the High Table, Morgan Forster wanted to exchange reminiscences about Kolhapur, Barbara Hoyle wanted to get to know my parents, having heard so much about them from me. The Salts were keen to invite them and exchange views about India. David Dew Hughes, Anant's supervisor also was keen to entertain them. Amongst my frinds, Kumar Chitre and Jamal and Suraiya were looking forward to meeting them.

Although my father had eaten meat when a student at Cambridge, by preference he was a vegetarian and so was my mother: although both ate eggs. So there was no dietary problem at breakfast, where the landlady provided eggs poached as my father was accustomed to. For lunch and dinner we had to look for vegetarian options for the main courses. Most places that we were invited to did their best to meet these restrictions. The seasonal dessert of strawberry and cream was, of course immensely popular with them since it was a rarity in India. So my parents felt lavishly entertained by their various hosts in Cambridge, some old ones of three decades ago and some new ones.

We took advantage of the balmy summer weather to take various bus trips to the countryside, my father often going down the memory lane. Once I rented a car and we made a day-trip to Oxford where my parents could see something of the 'other place'. Arun Mahajani came down from London to meet them and we went on the roof of King's Chapel (another privilege I enjoyed as a Fellow). Apart from Grantchester and the Orchard, we had a walk to Coton where we had tea in the tea garden.

We went to London for sight-seeing and also on a longer trip to the Lake District, where we stayed at the Old Dungeon Ghyll Hotel. We had some rain and some sunshine but have carried very happy impression of a scenic trip in that part of the country.

Meanwhile, Dr Lapwood, as the Chairman of Mathematics Faculty had seen to it that all formalities for my getting the Ph.D. degree would be over in time for me to get the degree on August 3. It was a memorable occasion for

me, having my parents present in the Senate House, as I was awarded the degree. King's being the College first in order of precedence, I was the first to get the degree. The Lapwoods, Lady Jeffreys and some student friends of mine were present and we had several photographs taken.

The one meeting that did not take place in this memorable trip was with Fred Hoyle. Although Barbara had us all visit 1 Clarkson Close for a sumptuous tea, we missed Fred, away on a visit to Russia. I had very much wanted my parents to meet Fred, but that occasion had to wait till 1968, when they met in Ahmedabad.

So on August 5, the four of us hired a taxi to take us to Heathrow. I was to go to India with my parents while Anant would return to Cambridge after seeing us off. I recall, the taxi cost around £6- £7 and had the advantage of door to door transportation. My parents left for Mumbai with a heavy heart, for they had had a very pleasant six weeks in Cambridge and England in general.

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This was my second visit back home and unlike my first visit, I was returning with some experience behind me. Moreover, I was returning with my parents. They had arranged to make the maximum use of the two months or so I was to spend in India. I should, however, mention a small episode connected with our travel from London to Mumbai.

As soon as we got into our seats on the Air India plane at Heathrow, Tai discovered that the umbrella she was carrying during her trip was missing. She was sure that she had it with her in the airport lounge, that it was not left in the taxi from Cambridge. The only conclusion we could come to was that it was forgotten or left inadvertently in her chair in the departure lounge. She was very sorry to have lost it for two reasons. It was a gift from Rajan Devadas, our friend in Washington DC, who had earlier been a personal assistant to my father in B.H.U. The second reason was that it was a folding umbrella the type of which was quite rare in 1963. Anyway, there was no time left to go hunting for it in the departure lounge, since the plane was shortly to take off.

My father told her to regard the umbrella as lost and stop fretting about it. I, however, decided to try out an experiment. When I reached Ajmer, I wrote to the Lost Property Department at Heathrow giving the details of the umbrella, when it was lost, etc. I did not tell Tai about this. After some two weeks I received a letter from the Lost Property Department stating that an umbrella matching my description had been located and given to the

Department by the cleaners and that I could take it upon due identification, including the letter I was reading. Tai was very delighted by this news. Sure enough, after I landed in London on my return journey, the umbrella was produced on my showing the letter to the Lost Property Department. To report the recovery of the umbrella, I sent my usual safe-arrival cable signed *Chhatrapati* Jayant. The title of *Chhatrapati* is assumed by the Maharajas descended from Shivaji, the legendary Maratha hero and as such was used by the rulers of my home state of Kolhapur. It also means literally, 'the owner of an umbrella'.

Dadamama and his family came to meet us at the Mumbai Airport where we stayed for a few hours in the retiring room in the Santa Cruz Airport premises. It was a convenient way to spend a few hours till we caught the connecting flight to Jaipur. At Jaipur we were met by my father's car driver and his PA Mr Dwivedi who came with my father's car. This was the car whose delivery my brother and I were eagerly waiting for in 1960. Its registration number 7939, as I had subsequently pointed out, contained the birthday months of the four of us.

The silver grey ambassador took us to Ajmer in two hours and I saw the spacious house my father had been allotted. It had four bedrooms with attached bathrooms and also had servants quarters, garage and a big garden maintained by a gardener. As a high government official my father was entitled to a domestic servant, a gardener and a chauffeur.

The stay in Jaipur was very relaxing. I have pleasant memories of drives in the countryside with my parents to Pushkar, Srinagar and other hilly directions for Ajmer is blessed with countryside of natural beauty dominated by the Aravali Hills, as well as large and small lakes. I also observed my father's daily routine and found that despite his mainly administrative duties, he had managed to maintain his academic interests, such as his work in relativity theory, his love of books in general and his interactions with intellectual groups in the neighbourhood. I found that he was greatly respected and admired by the locals. His integrity was beyond question and influential politicians accustomed to pressurising the Public Service Commission so as to get their favourites appointed to government posts, stayed away from him as they knew that he would not budge from the correct (merit-based) decision taken by the commission.

My mother was also finding useful occupations to fill her time, now that we (kids) were grown up and managing ourselves. She was fond of writing and reading as well as giving public lectures in schools and colleges. So she was

in demand by local educational institutions. In my brief visit I also gave talks in local colleges as well as recording a talk for the All India Radio. My father gave an interesting radio talk on his Cambridge visit.

After Ajmer, I was to visit Mumbai, Pune and Kolhapur to meet all my relations as well as family friends. I went by train from Ajmer to Mumbai stopping enroute at Ahmedabad, where I visited the Physical Research Laboratory and met Vikram Sarabhai. He invited me to stay with him and renewed his invitation to visit PRL whenever I was spending time in India.

In Mumbai, one of the memorable occasions was a public reception accorded to me by the famous Marathi personality P.K. Atre, who was the owner-editor of the daily Maratha which at the time was very popular. Acharya Atre was very proud of being a Maharashtrian and admired those from his state who achieved something. He felt that with my Cambridge successes, I needed to be publicly honoured. I felt very diffident at this gesture feeling that my career was just beginning and such an honour would not be well deserved. But once he had made up his mind, Acharya Atre was not to be dissuaded. He went ahead with the function and invited Wrangler G.S. Mahajani to chair it. The programme was well attended and Dr Mahajani spoke in very encouraging terms extolling my modest achievements and more importantly, expressing high hopes about my future.

In Kolhapur I had a very enjoyable stay. Large lunch parties were arranged in the Huzurbazar-wada as well as in the Narlikar-Bhavan where I could meet all my local relatives on mother's and father's side. I had brought my tape recorder with me and it was a great novelty. One interesting use I put it to was when Mavashi (my mother's aunt) started telling an old experience of hers involving a visit to the Girsappa Forest in northern Karnataka when bicycles piled on the roof of a bus were mistaken for a tiger sitting there! I quietly started recording her narrative and later played it back and she was greatly surprised to hear her own voice. An even more dramatic effect was when I recorded and played back the 'speech' of the caged parrot in the house. The parrot was visibly disturbed by the experience.

On the way back from Kolhapur, my parents and I stopped for a couple of days in Pune. Here, however, we greatly missed Vasantmama and his family: they were still in Ames, Iowa. The university seemed 'empty' somehow, without them being around.

So ended my brief but very satisfying visit to India which brought me renewed contacts with my near and dear ones, revived old friendships and made me feel somehow that I was not all that far from them. After all, when

we were in Banaras, we visited Maharashtra once in 2 to 4 years. This was no different. I was visiting after three years. As I came to realize, each subsequent trip made the distances seem shorter!

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I returned to Cambridge to resume my sedentary routine. Fred continued my DSIR grant at a higher level and I was getting Fellowship stipend at a reduced rate as per rules. But my Fellowship ‘perks’, like free meals and accommodation, continued as before. My work on the Wheeler-Feynman theory now began to extend beyond electrodynamics. The theory had shown how to describe the electrical forces as manifestation of electrically charged particles interacting across distances in space. Fred and I now wanted to see if we could describe other forces of nature in the same format and the most important of these was the force of gravity.

We were able to make progress with this work, thanks to a formalism developed by Bryce DeWitt and Robert Brehme some years earlier, which I accidentally came across. Using that framework, we found that if one defined the mass of a particle as arising from other particles in the universe, then one arrives at a set of equations describing gravity, very similar to Einstein’s. This concept reminded me of an idea discussed by the philosopher-scientist Ernst Mach, who had argued that contrary to the Newtonian concept that the inertia of a particle is its own intrinsic property, it depends on the background of all other particles in the universe. Inertia is the property by virtue of which the particle needs a force to ‘push it’, that is, a force to change its state of rest or uniform motion. It is measured by the mass of the particle. So our mathematical picture of mass was very similar to these ideas expressed by Mach, often called *Mach’s Principle*.

Einstein regarded Mach as one of his mentors and initially thought highly of Mach’s principle. He had expected that the general theory of relativity that he had propounded as a replacement of Newtonian ideas of gravitation and motion, would turn out to contain Mach’s principle. Later, however, he found that this was not so and began to be disillusioned about Mach’s principle.

What excited Fred and me most was that our way of looking at inertia and mass seemed to offer a very satisfactory way of bringing together general relativity and Mach’s principle. For, our method started with Mach’s ideas and led to a more general and wider framework than general relativity, yet we could show that in a certain simplifying situation our theory reduced to general

relativity. Thus starting from Mach one could end with Einstein, if one followed the route that lay ahead of us.

While working on this exciting theoretical concept, we were aware of, and also involved with exciting developments on the observational front. In 1962, when Fred had gone to Australia, he had become involved with an observational programme of measuring the position of a bright radio source 3C273, using the method of lunar occultation. This meant, observing the radiation of the source as the Moon's disc moved across it. While the Moon shadowed the source, its intensity would drop, picking up again as the lunar disc moved away. Since the astronomer knows the Moon's path with great accuracy, this technique enabled the observers to know the position of the source with a great deal of accuracy, far more so than a direct measurement would allow. The Australians were able to do this measurement at the big radio dish at Parkes.

This measurement enabled optical astronomers to identify the radio source with its optical counterpart. This procedure may be compared with the following example from daily life. Suppose in a class, a rowdy kid blows a whistle. The teacher looks up to see who did it. If her sense of hearing is very good, she can identify the kid. In the same way, astronomer can identify the optical image with the radio image provided the direction of the latter is very precise. In our classroom example, if the teacher's sense of direction is not very good, she is in some doubt as to which kid was responsible.

The source 3C273 was one of those that Hanbury Brown had talked to us about at Jodrell Bank, some two years earlier. It was a compact radio source and the early identification led to its being mistaken for a star. Later studies in 1963 by Maarten Schmidt and his colleagues at the Palomar Observatory showed that it was possibly a much more powerful source than a typical star, lying farther away than stars in our Galaxy, taking part in the expansion of the universe. As more such sources became known, they were seen as belonging to a new class of objects which were called *quasi stellar sources* or more briefly, *quasars*.

At about the same time, that is early in 1963, Fred Hoyle and Willy Fowler had proposed the possibility of there being 'supermassive stars' in the universe, stars a million to a billion times as massive as the Sun, which radiate powerfully because of their strong gravity. This energy is released as the source *collapses* to a very small size under its gravitational field. It was immediately seen that the Hoyle-Fowler idea might explain the powerful radiation coming from the compact quasars.

Here was thus a synergy of theory and observations leading to a new area in astronomy: an area where the strong gravitational field was responsible for emission of powerful radiation from a compact region. This exciting possibility led scientists to convene an international meeting in Dallas, Texas. Alfred Schild, Englebert Schücking, and Ivor Robinson were the Texas-based astrophysicists and relativists who initiated this meeting which was to be held in mid-December.

Fred was, of course, invited and so was I. Robinson promised air fare. I was naturally excited with the prospect of attending the meeting. I also planned to visit Vasantmama in Ames after the meeting and also, since I was going to pass through Chicago, to visit Chandra in Yerkes. When attending the Cornell meeting Chandra had renewed his invitation to visit him when I was passing through Chicago.

In the autumn, the famous popular science journal *Discovery* asked me to write an article on gravitational collapse and its relationship to the newly discovered quasars and the Texas meeting. This was to be my first assignment of popular science writing. The article eventually appeared in the magazine early in 1964 and was very popular. I was surprised, however, that quite a few of the reprint requests were from medical doctors. I suspect that from the title *Gravitational Collapse*, they presumed the article was about some disease!

As we were getting ready to attend the Dallas meeting the terrible news of the assassination of President Kennedy in Dallas came through. It was a shock to all at the time and the media had no other topic to talk about. I wondered whether the conference would go on as scheduled. It did.

The Texas meeting was very memorable. I had travelled with the astronomer David Dewhirst from the Observatories and both of us were seated side by side in the aircraft from London to Chicago. Both of us had watched the golden sunset on the Western horizon. A few minutes later, however, David drew my attention to the fact the Sun was visible again and in fact, it rose from the West! This happened because just in those moments the westward speed of the aircraft exceeded the eastward speed of the Earth's surface at the latitude we were flying at. This unusual sight is visible when flying in a jet at high latitudes.

On landing in Dallas, we took a cab to the Hilton Hotel in downtown, where we were to stay. It was, of course a five star hotel, although I was struck by the smallness of the typical room. The next morning was a free morning and some of us delegates walked to the spot where the assassination had taken place. There was a temporary memorial at the site bedecked with flowers. The

building of the Texas School Book Depository, from where the sniper had taken aim loomed large nearby.

The Texas meeting was inaugurated by J. Robert Oppenheimer, the creator of the atom bomb. Hoyle was the first to speak and he set the tone by pointing out that the available evidence about quasars pointed to generation of vast energy in a small volume. He stressed the fact that nuclear energy generation that works for stars, proves inadequate for quasars. In the end he also referred to our work on creation of matter that, he felt, could be relevant to the quasars. He was followed by Willy Fowler who showed why and how Newtonian gravity and general relativity differ when one is looking at very massive objects.

I will not go into details that are too technical for this account. I will simply say that the Texas symposium was the first instance where relativists came in close contact with astrophysicists and became aware of the need to expand the horizons of their interests so as to try to come to grips with the situations like those presented by quasars. The last morning of the meeting was notable for one result described by Felix Pirani. He reported a new exact solution of Einstein's equations obtained by a young New Zealand relativist, Roy Kerr. This solution described the gravitational details around a spinning object. Although noted as an interesting curiosity at the time, the Kerr solution was to play a key role in our understanding of black holes.

I should not close this account without mentioning that it was at this meeting that I first met A.K.Raychaudhuri, whose work had inspired me when working on spinning universes. He had flown over from Calcutta and both Hoyle and I were delighted to meet him. Hoyle's first remark after this meeting was: "But he looks so young!" Because of the depth of his work, both of us had imagined him to be an older person.

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On the last day of the conference, I flew from Dallas to Des Moines via Oklahoma and reached there by late afternoon. This was the airport that was nearest to Ames, Iowa, where my uncle Vasantmama, aunt Prabhramami and their baby daughter Snehalata were residing during Vasantmama's tenure as a Visiting Professor at the Iowa State University. I had arranged to spend Christmas with them before returning to England in early January. One immediate difference I noticed when I stepped out of the aircraft (-there were no aerobridges those days-) was the extremely cold weather outside. I had

never encountered such low temperatures, around 20 Fahrenheit, in England. I was now in the mid-West known for its severe winters.

Vasantmama was there to receive me and he had arranged a taxi to take us to Ames. I was very relieved by this as I had dreaded the journey by bus which I was planning to make if Vasantmama did not come. On reaching their apartment, I was delighted to meet my baby cousin for whom I had brought a huge teddy bear from Cambridge. The VSP apartment was very efficiently heated and was perhaps too hot, but I felt it comfortable after the bitter cold outside.

The life in Ames was sedentary, as expected in a small town. I met the friends of VSP in the apartment complex as well as in the university and we were invited to several homes. The most memorable was the Christmas spent with a farmer's family in a small village called Melbourne. Our host came to pick us up and drove us through typical farm country of the mid-west along roads going straight for miles and miles. The X-mas festivities were in the air...there were presents hanging from the Christmas tree, carol singing and turkey lunch. The weather was sunny and dry and of course very cold.

I had brought work to do in this quiet ten-twelve days stay. I wrote the draft of three papers by Fred and me which were eventually published in the Proceedings of the Royal Society. These papers described how action at a distance can be mathematically represented in a spacetime whose geometry was not Euclid's, i.e., the geometry we learn at school. In the presence of gravity the spacetime geometry becomes 'curved'. The work of Wheeler and Feynman needed to be described in such a geometry if it were to apply to the expanding universe. The papers also dealt with the creation field as an action at a distance effect.

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After Ames, I proposed to stop in Chicago and see Chandrasekhar. I had some correspondence with Chandra before leaving Cambridge, and he suggested my staying two nights in Chicago and spending the day in between coming to Yerkes by train in the morning and returning in the evening. He sent the time table of trains that I could take.

That day stays fresh in my memory. From Ames I went to O'Hare Airport in Chicago and from there went to the hotel in downtown Chicago where I was to stay. It was bitterly cold, but the hotel room was well heated. I was dreading the early morning train journey, but the station was not too far and

after an early breakfast I could catch the train to Walworth. Chandra had come to the station to meet me and took me to the Yerkes Observatory precinct. He showed me round the telescopes and the library as well as his office from where he managed the editor's job of the Astrophysical Journal. Then he took me to a restaurant in town for lunch. He himself was vegetarian and so his choice was limited whereas I could manage a typical American sandwich lunch.

After lunch my brief was to talk to his group presenting highlights of the Texas meeting. Chandra did not attend the Dallas meeting since he avoided travelling in the southern states of the country where there still were pockets of racial discrimination. I gave my talk, bearing in mind the caution given by Chandra over lunch, that he could be severely critical from the floor if he encountered the speaker presenting ideas that seemed incorrect to him. He had jokingly mentioned an episode when he continually interrupted the talk given by Ray Lyttleton (who had supervised me at Fitzwilliam), saying that he could not see how Ray got that particular result. Ultimately, exasperated by these interruptions, Ray Lyttleton retorted: "Chandra, an elephant could trample a fly and say that he could not see how it got there."

Sure enough, I soon ran into Chandra's objections, not, I am happy to say, because of what my own ideas were, but what I was reporting upon. I recall I was presenting Willy Fowler's arguments on the gravitational energy of a massive star as an indicator of its instability. Chandra snapped back that one cannot use these energy arguments alone to claim stability or otherwise. Rather, one should do a mathematical analysis of perturbations of the system. I also recall that following this episode, Chandra himself went ahead and did the calculation and published an important paper on his conclusions.

It was a pleasure to meet his wife Lalitha and have dinner with them before catching my train back to Chicago. I was getting restless as Chandra kept sitting chatting at home when, I felt, the train arrival time was approaching. Chandra was, however, well familiar with local conditions and dropped me at the railroad track just a couple of minutes before the train rolled into the small station.

The next evening I took the plane to London, which was diverted to Manchester because London was under a thick fog. After waiting there for a couple of hours we finally made it to London and I eventually got back to Cambridge.

That was early January, 1964. Just a year back I had seen the New Year in as a research student struggling to get his Ph.D. A lot of water had flown in my life during 1963. I had my doctorate, moreover, I had won a College

Fellowship. I had attended two major conferences in the United States and my work was becoming known to a wider range of scientists. I had begun to experiment in science popularization through talks and articles...the one in *Discovery* was to be the first of many such articles in various popular science journals. I was able to host my parents during their visit to Cambridge. My acquaintances with other Cambridge intelligentsia were growing...in short, I was shaping into a typical Cambridge don!

## A MATTER OF GRAVITY

FTER becoming a don at Cambridge, my immediate future goal was to remain in Cambridge till my Fellowship ran out. However, Fred Hoyle was working on other possibilities. Like the Burbidges, Geoffrey and Margaret, who had got lucrative positions in the newly established University of California at San Diego in the beautiful seaside resort of La Jolla, Fred was also receiving attractive offers to move to Caltech or to Cornell University. He was also promised positions for John Faulkner and myself who worked closely with him. One arrangement that I was to consider was of spending seven months in the year in the USA and the rest in India and Cambridge. I also had received a similar offer from the University of Texas at Austin.

However, Barbara was not too keen to move to the USA, and Fred was therefore considering other options that kept him in Cambridge. He was finding the working of DAMTP rather bureaucratic and felt that the academic freedom enjoyed by a typical American scientist in travel, inviting visitors, attending conferences, taking post-docs, etc. far exceeded that of his British counterpart. So he was beginning to look into the possibility of establishing an autonomous centre of Astronomy in Cambridge. In the British system, this needed support from the Government and also from the University. So he had to get his ideas discussed and approved by various local and national committees.

My own compulsions at this stage were to continue with my research and to seek locations and opportunities that would be conducive to this goal. My

brief visits to the USA attracted me to the US academic system, as it did Fred, but I preferred the living style and social environment in the UK, especially in Cambridge. It would not have been difficult for me to have an academic position in Cambridge University and a teaching fellowship at a Cambridge College. Indeed I had already been sounded out for a teaching fellowship by some of the other colleges.

In 1964, I had been well established at King's and had good friends like Morgan Forster and George Salt. I frequented the Arts Theatre with Forster and had many pleasant meals and discussions at the Salt house. It was a continuing pleasure to visit the Cunninghams, Lapwoods (who had recovered from their shocking family tragedy), the Jeffreys, and the Thatchers. I had continued my Fitzwilliam connection by remaining their Director of Studies in Mathematics. So I dined there once a week. Fitzwilliam now had a much bigger presence on the new campus at Huntingdon Road. I should also mention my family physician Dr Apthorpe Webb and his family who were also very hospitable and invited me from time to time.

Arun Mahajani used to visit off and on and his visit would mean a pleasant meal in an Indian or a Chinese restaurant. On some occasions Anant and I would go round with him into the countryside if the day was fine. My sub-continental group of friends included Amartya Sen who later left for India to take a position in the Delhi School of Economics, Jamal and Suraiya from the erstwhile East Pakistan, Khalid Ikram from the West Pakistan and the Gwalior couple, Anant and Nirmala Rajwade. Anant was a student of mathematics, doing his Ph.D. in number theory. But the remarkable fact about him was that he was a very able Sitar player, despite having only two fingers on each hand.

The Lent and Easter term feasts gave me opportunity to invite friends like Peter Schneider, Arun Mahajani, etc. Once Morgan expressed desire to eat good Indian food and so I took him to London to the restaurant at India House, Aldwych. I had visited the self service section many times, but for a person of the age and stature of Morgan, a sit-down lunch was more appropriate.

However, this state of affairs was given a significant push by a development on the research front.

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The three papers I had written out while in Ames, Iowa were finalized in consultation with Fred and submitted by him to the Royal Society. They were accepted in due course and Fred was asked to present the work at a meeting of

the Society. He arranged for both of us to present the work in two parts on June 11, 1964, at the Thursday meeting of the Royal Society.

The meeting was open to all and I had sent information of this meeting to several friends who might be interested in attending it. Amongst the non-scientists who attended were Arun Mahajani and Bernard Miles and also the Hoyle family. There was of course a galaxy of scientists present including Abdus Salam, Hermann Bondi, Bill McCrea, Ray Lyttleton, Sir George Thomson and Lord Birkett. There were quite a few people from the press as the meeting got good media coverage. First I presented the general action at a distance formalism including electrodynamics and then Fred presented the gravitation part.

After the presentations there were questions and comments and the general response was very favourable. Those present appreciated our approach of starting with Mach and ending with Einstein (as described in the previous chapter). However, I should mention one brief episode which has since been hyped and misrepresented. This relates to the intervention made by Stephen Hawking then a graduate student at the DAMTP.

Prior to our presentation at the Royal Society, I had discussed the work informally with Dennis Sciama and others at the DAMTP including Stephen. Stephen had subsequently worked out a result which, he claimed, led to the total contribution from the universe to the mass of a typical particle being an infinite quantity in an expanding universe. I had at the time pointed out that his calculation was based on an oversimplification and missed out the essential feature of the theory, technically called its ‘non-linear’ character. This simplification indeed vitiated his result. I had described to Fred the essence of Hawking’s calculation and he had also agreed with my criticism. However, the matter had slipped from his mind subsequently.

At the Royal Society discussion, Stephen raised the same issue and the Chairman invited Fred to comment. Since Fred had forgotten our earlier discussion on this point, he looked puzzled and so I stepped in to reply. I reiterated my objection to Stephen’s calculation that it ignored the nonlinearity of the theory. Stephen had no further comment to make. The matter rested there.

In some of the recent biographies of Stephen, including a BBC programme on him, however, a distorted version of this episode has been given. The impression is created that Stephen’s objection was an important one and was publicised in the papers the next day. It was also claimed that Fred was annoyed with me for having discussed our work with Stephen prior to its presentation.

Both these claims are false. Fred was aware that I had discussed this work with Dennis and his students which included Stephen, and he had raised no objection to this action on my part. As he had forgotten our earlier discussion on Stephen's objection he was certainly puzzled and after the Royal Society meeting asked me "What was Hawking on about?" more as a matter of curiosity than from any annoyance.

As for any media publicity to Stephen's objection was concerned, there was none. The matter has been hyped since Stephen became a media icon. All the newspapers published that evening or the next morning carried accounts of our presentations only with no mention of Stephen. Later, on the Sunday the 14<sup>th</sup> June, the *Observer* carried a large picture of me standing before the blackboard with our basic formula written on it. This account and the photograph were reproduced by many other papers, especially in India. Evidently, if the Hawking comment were considered important, the media would certainly have hyped it.

Indeed, I was overwhelmed by the enthusiastic response from the media. Fred had been a media figure for many years and for him the experience was not new. For me it certainly was. Apart from the *Sunday Observer*, the *Telegraph* had an extensive interview of me. [*The Telegraph* commented on my dress by describing me as a 'tidy mind in untidy habits'.] *The Guardian* carried an account by John Maddox. The *BBC* ran news bits on it and there were many interviews and films featuring me. *The Time* carried an account in its science coverage.

The media in India followed up with their own accounts, buoyed up as they were by the British media applauding an Indian. I received several letters from India from relatives, friends and also strangers. One letter I particularly recall was from Indira Gandhi congratulating me and stating that had her father been alive (Nehru had passed away just a fortnight before) he would have been thrilled to see this news. Several persons from the Indian High Commission also wrote eulogizing me. A senior member wanted to arrange for me and Hoyle to meet members of the House of Lords over lunch, but we declined the offer. From a diplomatic angle the matter was seen as an excellent example of cooperation between scientists from India and England.

The official who wanted to invite us to lunch at the House of Lords also asked me if I would not mind visiting India on a tour of universities, lecturing on my work. He said that the Government of India would be very happy to arrange it. I happily agreed since it provided me with an opportunity of discussing my work with fellow academics. It also gave me an occasion to visit my parents at Government expense! Eventually such a trip was organized by

the Indian Council for Cultural Relations (ICCR). I will write about the extraordinary reception I had on this trip in the following chapter.

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The media interest, fortunately, lasted as a nine days wonder. The letters from various friends and acquaintances continued for a longer period, however, but those too tapered off eventually. The summer was a pleasant one and so Anant and I decided to travel around a bit. In the spring we had had a trip to Barcelona along with Chandra and Raj, and it had been a very pleasant one what with the fish-variety, paella, the bull ring, flamenco, and local sights. In late June we decided to join Arun Mahajani and the Hardikars, Sharad and Leelatai on a short driving tour of North Wales. We rented a car and drove it from Cardiff to Chester. The weather was kind and the scenery excellent. On the way back Arun gave us an excellent dinner in a Chinese restaurant in Cardiff.

Kumar Chitre completed his Ph.D. on solar physics in 1964 under the guidance of Leon Mestel. He secured a lecturer's job at the University of Leeds whose astrophysics group was headed by T.G. Cowling a very distinguished astrophysicist. Kumar arranged for me to be invited to the University of Leeds for a seminar. This also gave me an opportunity of seeing something of Yorkshire dales and moors. Kumar's brother, Duttakumar, aka Prakash, who was at Cambridge as well as his cousin, Charu Hazarnavis, were also going to be there.

My seminar on gravitation theory went off well and I got to know several persons in the department apart from Cowling. The relativist, F.H.J. Cornish was especially friendly and offered to drive us round the countryside. We gladly took up the offer, although we had also arranged to go on our own by renting a car, with myself driving. Both our trips were very enjoyable, and I drove some 230 miles in a day through winding country roads. We saw the Bronte country, the area around Fred Hoyle's birth place Bingley, the hills and dales, old abbeys and other attractive sites. There was one awkward moment, however. We went to see an old abbey on our trip, and had a chat with the old caretaker there. The next day, Fred Cornish took Kumar and me to the very same spot and we did not have the heart to tell him that only yesterday we had been there. So we dreaded meeting the old man in the abbey lest he recognized us and talked about our previous visit. Fortunately for us he was not around and we escaped without embarrassment!

At Leeds, Kumar and I spent one day watching the Australians play a cricket

test match. When we went to our seats we saw that the row in front had another cricket enthusiast we knew, Professor Cowling. As we watched the match, we also noted his reactions to the various shots the batsmen played and the balls the bowlers bowled. It did not take us long to realize that Cowling was a connoisseur of the game and applauded only when a player really deserved. For example, on one occasion the batsman got a four out of the edge of his bat and while most of the crowd clapped the boundary, Cowling refrained from doing so.

All in all, I carry very happy memories of my Leeds trip.

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It was a measure of the notice I was receiving from the Indian community, that I received an invitation to a luncheon party at London's Café Royal in honour of T.T. Krishnamachari, a cabinet minister in the Indian Government then on tour of the UK. I was seated next to Hansa Mehta, wife of the Indian High Commissioner.

At King's Ladies supper party, which was the feast to which lady guests were invited, I had Mrs Clarke as my guest. She enjoyed the evening whose highlight apart from excellent food and dancing was the singing of madrigals from the gallery in the Hall.

Fred was planning to spend the Michaelmas term at Caltech and suggested that I too come there at least for three months starting October. So I tentatively kept those three months free, and shifted a possible visit to India at the invitation of the ICCR, to early 1965. But before the US trip, there was another short trip in the offing. During the summer of 1964, Anant and I decided to have a short tour of Paris in the company of Arun Mahajani. Anant was to visit Prague for a conference and we arranged to meet in Paris with him travelling back from Prague to Paris and Arun and I going from London to Paris. As it was, we were more than two hours late in reaching Paris and found Anant patiently waiting for us at the town terminal as planned. Our original choice of Grand Hotel du Globe (where I had stayed in 1961) was changed at the last moment by the travel agents and so we stayed in another hotel near Opera.

Like my previous visit to Paris, this too was very enjoyable, though shorter. We 'did' the main sights like the Louvre, the Eiffel Tower, Sacre Coeur, the palace of Versailles, etc. We also had samples of excellent food and Arun fulfilled his dream of visiting the Christian Dior store in Paris. He had been a collector of ties and Dior ties came up high on his list.

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Fred was fond of Scottish hills for trekking just as he liked the Lake District. In August, Joe Jennings, an old friend of his, originally from Yorkshire but settled in Australia, was visiting England and Cambridge in particular. As Joe was fond of trekking, Fred planned a ten-day trip to Scotland with him and asked me whether I would also like to come along. I gladly agreed to join them. Fred planned to take his caravan and drive it all the way North, parking it at a convenient spot each night so that the trek could begin early morning the following day. So we three set off one morning from Cambridge and joined the A1 going North to Yorkshire. It was then that Joe realized that he had forgotten his climbing boots at the house he was last staying in.

Since it was essential for him to get the boots, Fred found a solution to the problem. He asked Joe to ring up his hosts in Cambridge and request them to post the boots to the post office in Inverness, North Scotland, addressed to him *poste restant*. He expected that the shoes would catch up with us in Inverness in three days. This did happen and I was quite impressed by the efficiency of the British parcel service.

We started by climbing Mickle Fell in Yorkshire. The peak was not high, but reaching it required a long route through the boggy ground and by the time we returned we had done some ten miles. We next moved to Glencoe in southern Scotland where we climbed the peak called Bidean. Then we moved to the northern parts. Fred Hoyle has written in his autobiography how he systematically climbed most of the tall Scottish peaks generally called 'Munros'. His ambition was to join a group of serious climbers and go climbing the peaks in the Himalayan range of heights around 15,000-20,000 feet. A detailed plan had indeed been made, but because of the Chinese border war with India, there were restrictions on foreigners on going into the Himalayan border territory. So the plan did not materialize.

Our most strenuous day on this trip was when we climbed Suilvan a peak of some 2400 feet height that required a walk of six miles each way for reaching it. We were quite tired and famished at the end of the day as we came down to the caravan. As luck would have it, we came across an inn which advertised a buffet dinner at a fixed price of £ 1. This was just the thing for us and to enquire about when the dinner service opened, we went to the main door of the inn. Fred rang the bell and the door was opened by a butler in evening dress, straight out of P.G. Wodehouse novels. He took one look at us, saw our 'ragamuffin' appearance and politely directed us to a side door: we were evidently not respectable enough to be seen at the front door! We went there and he gave us the necessary information, leaving it to our commonsense to dress suitably

for the buffet. So we reserved a table for an hour later, came back to the caravan and washed and changed to jacket and tie. The butler was evidently relieved by our transformation and let us in at the front door. The meal, I must say was one of the best buffets I can remember, probably because we were so hungry!

As I had some urgent work to do, I came back a couple of days sooner, by train and was in Cambridge in time.

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During 1964, the disagreements amongst the faculty members of the Department of Applied Mathematics and Theoretical Physics came to a crisis. The then Head of the Department, George Batchelor ran the department more like a bureaucrat than as a visionary academic. While it helped running the department in practical terms, there were no academic highlights to emerge. Fred Hoyle, who led the dissidents felt that a see change in the philosophy of running the department was called for. He preferred fewer rules and regulations, more facilities for academics, a more vigorous visitor programme and stress on interactive meetings.

In 1964 the first five years of DAMTP were to be over and there was going to be an election for its Head. It had been agreed that the Headship should rotate amongst the senior faculty members every five years, and so the expectation was that George would relinquish the post at the end of five years. This did not happen and he offered himself for re-election. Fred was interested in the position since he wished to bring in many reforms. There was considerable lobbying of the faculty. According to the accounts of the younger faculty, it seems that George Batchelor ran a more professional campaign with well defined manifesto than Fred Hoyle and when it came to voting, he won the election.

Unfortunately, feelings ran very high during the election campaign and accusations-counter accusations were such that even after the campaign, considerable animosity remained between Hoyle and Batchelor. For example, Fred stopped coming to his office in the DAMTP, and preferred to work from home. But a result of this unfortunate development was that it made Fred even more determined to create an autonomous centre for research in astronomy at Cambridge. He started renewed efforts at getting such a centre through DSIR. He was also moving the ruling Tory Government for a policy decision and the Minister for Education and Science, Lord Hailsham was sympathetic to the idea.

In the general election of 1964, however, Harold Wilson's labour party came to power by a wafer-thin majority and several existing equations changed. In a populist decision, the new Government set up several provincial universities and to reduce the importance enjoyed by Oxford, Cambridge and London, it adopted a policy of greater support to the new universities. Part of this policy was to create new facilities preferentially at the new universities, since the Big Three already had a lot of them. Thus the plan for setting up a national autonomous centre in astronomy was approved, but not in Cambridge as Hoyle was pushing for, but near Brighton, as part of the new University of Sussex. It was argued that as the major national facility for optical Astronomy, viz. the Royal Greenwich Observatory, was housed in Herstmonceux Castle in Sussex, the new Centre would have a healthy interaction with the observing community at the RGO. Hoyle was invited to be its first Director, an offer which he politely refused. Bill McCrea was subsequently appointed Director of the Sussex Astronomy Centre.

However, this setback did not deter Fred, who now began renewed efforts at bringing such a centre to Cambridge, through *private funding* if the Government help was not forthcoming. In the meantime, he shelved his plan for migrating to the USA, and continued his annual visits to Caltech.

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John Faulkner and I duly received our invitations from Willy Fowler for visiting his group at the Kellogg Radiation Laboratory in Caltech. These also provided one way air travel London to Los Angeles 'in category Z'. This category, as John and I discovered allowed no break of journey. So I had to shelve my plan of visiting the Dilwalis in New York for 3-4 days before heading for LA. We got the US visa in the last three to four days of September and arranged to fly TWA from London to LA via New York. (Non-stop flights along the polar route had not started by then.) There was a gap of two hours at JFK, (the Idlewild Airport had been renamed after John F. Kennedy) but we found that one hour of it was eaten by aircraft delays and the other was almost taken up by long queues at immigration and customs. With ten minutes left for the LA flight John and I rushed to the internal flights terminal. We were allowed to board and our baggage was taken at the gate itself! So at the other end, we had it sooner than the others.

It was just as well that we did not miss this flight, since Willy had sent a Caltech car to meet it. So we had a smooth ride to the Athenaeum Club in a

chauffeur driven limousine. John, for whom this was the first exposure to the USA, was impressed by the gliding limos, the wide roads and the illuminations in the streets. We were to stay in the Athenaeum till we found an apartment to rent. The charges here had been increased since my visit last summer, from \$6 to \$9 per night. So it was in our interest to find a more permanent accommodation.

The weather at this time of the year was very hot with the highs in the upper nineties (Fahrenheit) and the smog made it worse. The smog was a new experience to us, in the sense that it was a pollution generated by the automobile fumes. The LA area is notorious for the large number of automobiles and in those days there were hardly any controls on pollution. Also, the local geography of the LA neighbourhood was such that smog was trapped and not allowed to escape. In the early days we were covering distances from A to B to C...etc on foot and walking on hot foothpaths with eyes smarting under smog was no pleasure. John soon bought a car and rented an apartment at 1024 East Del Mar Boulevard, only a couple of blocks from Caltech. It was a small one bedroom ground floor apartment with all mod-cons, with the landlord (Mr Pysher) living on the first floor. John was intending to stay for at least a year, whereas I intended to remain only till the end of December. So I shared the apartment with John, sleeping on the sofa in the living room and also shared the running charges of the car.

The academic aspects of my visit were very fruitful. I was asked to deliver a colloquium on action at a distance which was very well attended and included Feynman, Christy, Fowler and other well known Caltech physicists. Fred Hoyle was expected to be present, but his flight got inordinately delayed and so he was absent. I had good discussion afterwards and Feynman stayed back to talk after the general discussion was over. He confessed that he had to give up on action at a distance as he was not able to successfully link it to quantum theory and warned me that this would be the major hurdle Fred and I faced if we wanted to pursue that path further. Although he was correct about the difficulties ahead, we were able to surmount them, ironically through the formalism that he himself had developed.

Fred turned up the following day and we shared an office. Thus we could work further on our earlier ideas on the creation of matter. This work led to three papers which eventually were published in the Proceedings of the Royal Society. In retrospect, they said a number of things that were considered pretty radical at the time, but which have now become part of the accepted dogma. The first paper argued for creation of baryons (heavy sub-atomic

particles like neutrons and protons) in explosive fashion in regions of strong gravity. The creation process required a negative energy field and the *C*-field that we had thought of did the job well. The original formulation of the field had been suggested to us by Maurice Pryce, a senior theoretical physicist who had once guided Fred Hoyle when he was a student. Today the idea is much discussed as a ‘phantom’ field.

The second paper envisaged ‘phase transitions’ in the *C*-field. A phase transition is a sudden change in the physical state of matter such as water turning to ice or steam. In a phase transition of the *C*-field, matter creation is switched off in a region. Such a region therefore expands at a slower rate than the main body of the universe that expands very rapidly. Such bubbles were envisaged as describing the universe we observe. Cosmologists who work on the currently popular ‘inflationary’ universe would appreciate that this 1964 idea anticipated it by some 17 years.

Finally, the third paper argued that galaxies having elliptical shape have a massive concentration of matter of the order of a billion solar masses, which controls the shape of the overall galaxy. The nomenclature of ‘black hole’ had not been in the literature then, but our concept was very much that of a supermassive black hole type object. At the time the idea of a black hole at the nucleus of a galaxy was laughed at as being very esoteric. Today observations very often suggest the presence of such massive concentrations in the galactic nuclei.

This work was published in 1966, but I gave seminars on it in 1964 at the universities of Maryland, Harvard and Princeton. These ideas were considered provocative as the astronomical and physics community was not yet prepared for them. One moral that I have learnt from my (and more so from Fred Hoyle’s) scientific career is that to have the maximum impact of your ideas you must be only slightly ahead of time: if you are ahead of time by several years, (as we were on this occasion) your ideas are dismissed as outlandish and then forgotten.

The highlight of my academic experience at Caltech was the course of lectures given by Feynman on his technique of path integrals. Feynman had great histrionic talents as I have remarked before and his lectures were certainly very interesting and thought provoking. These lectures were subsequently written up in book form and are very readable.

While in Pasadena, the township which houses Caltech, I was contacted by Chitra and Dileep Adarkar. I knew Chitra from the B.H.U. days since her family was our neighbour. She was the daughter of Professor S.S. Joshi, Head

of the Chemistry Department at B.H.U. and had had a very bright career leading to diplomatic service. Dileep, an aerospace engineer was cousin of Arun Adarkar, my contemporary at Cambridge. His father B.P. Adarkar had also been at B.H.U. before joining foreign service. Chitra and Dileep were very hospitable to me, taking me to see Disneyland, inviting me (and later John also) home for supper, etc. In fact I still recall with pleasure my first visit to Disneyland with them. The concept of an amusement park on such a grand scale was new to me and I thoroughly enjoyed the rides. Although, I felt that you would enjoy them more if accompanied by children. Indeed my later visits to Disneyland with my daughters confirmed this expectation.

John and I took several opportunities for sightseeing. Locally we visited the Marineland, the arboretum, the observatories at Mount Wilson and at Palomar, where we went on an astronomers' picnic, the downtown area etc. We also took longer drives outside the LA area like the Joshua Tree National Monument, the Sequoia Tree national Park and the Yosemite National Park. These latter two we included in a grand tour of California ending in visit to San Francisco. At SF we had the good fortune to be invited by Amartya and Navaneeta Sen to stay with them. Amartya was visiting UC-Berkeley and lived near the university area. We toured round the San Francisco highlights before returning to LA along the scenic coastal road. Close to my departure for Cambridge, John and I were invited by the Rotary Club of Pasadena on a tour of the Grand Canyon, where we were offered local hospitality at Prescott with Rotarian families. We also spent one night at the Bright Angel Lodge at the Canyon itself. There we descended some 2,500 ft into the canyon before climbing again. The trip was the reverse of climbing a hill since here one descends first and climbs later! We took about four hours for this trip.

One of my most memorable experiences at Caltech was having tea with Mrs Hubble, the relict of Edwin Hubble who made the discovery that the universe is expanding. Mrs Hubble lived in the select Pasadena suburb of San Marino, and she invited Fred Hoyle and me to tea. It was nice to talk about various matters including the visit of Morgan Forster to her house. Other Hoyle friends were the Keatings, who also lived in San Marino and had a beautiful house the likes of which I had only seen in pictures of Hollywood mansions.

Anand Sarabhai's friend at Caltech, Tom Benjamin was our frequent fellow-diner in the various restaurants of Pasadena. Tom is a molecular biologist whom I had first met in Cambridge. He was a post-doc at the MRC Unit of molecular biology in Cambridge. Thanks to him we got introduced to many different types of restaurants.

My stay at Caltech could have continued for another three months since Willy had invited me for six months. However, future commitments, especially the lecture trip to India was due to start in February and so I decided to wind up my Pasadena stay and return to Cambridge by mid-January.

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Before I left the USA, however, John and I went to attend the second Texas symposium, like the one held in Dallas in 1963: only this one was in Austin. Willy and Fred were there as were the Burbidges. I also met Professor P.C. Vaidya who was on a sabbatical visit to the University of Maryland. His 'Vaidya solution' for a radiating star obtained twenty years back was now being seen to be of great relevance in the study of supermassive radiating objects like quasars. The Texas series of meetings have since taken place in every 'even' year. They are still called 'Texas' meetings even though they may be held anywhere in the world. Nevertheless, I missed here the excitement and spontaneity of the first meeting. Certainly, the later meetings have become too stereo-typed and one finds that scientists of different disciplines come only for their own topics and thus do not get into the 'interdisciplinary' spirit of the original meeting.

On my last day in Pasadena, that is, January 1, 1965, John and I watched the famous 'Rose Ball Parade' down Colorado Boulevard. It is a parade of floral floats of various imaginative subjects and it attracts huge crowds of tourists. The parade starts in early morning and is over by late morning, which suited me fine. For in the afternoon, John was to take me to the LA airport for my flight.

On my way back I made a two-day halt in Salt Lake City since I had been keen to see this important headquarters of the Mormon sect .- more so since reading the Sherlock Holmes novel *A Study in Scarlet*. From Salt Lake City I flew to Washington DC where I stayed with Jamal and Suraiya. Jamal was a post-doc at the University of Maryland where I had been invited to give a colloquium. I had met and known Howie Laster the Chairman of the Department of Physics and Astronomy, when he had spent a sabbatical term at the DAMTP. In fact Howie had been given Hoyle's office since Fred had stopped using it in protest against Batchelor.

At Washington I renewed my contact with Rajan Devadas, the former assistant of my father at B.H.U. Rajanji, as I usually addressed him, had briefly visited me at Fitzwilliam in 1961. Now he had settled in the USA. He had married a Japanese lady, Kimikosan-san who worked in the Library of

Congress. Rajanji worked as information officer in the Indian Embassy, but later set up his own business as a photo-journalist. He was an excellent photographer and I was to have a long standing close relationship with the Devadas family. 1965 January marked the start of it.

From Washington I flew to New York and spent a week with Charat and Yashoda Dilwali. It was winter at its height and although not as cold as Ames, Iowa, the weather was such that one preferred to remain at home. Still I made two day trips. I flew by the commuter airlines to Harvard to give a talk there and took a bus to Princeton for a similar reason. Both trips were satisfying since the ideas I had to present were received with interest. Amongst the young astronomers whom I met there and came to know well in later years were Phil Soloman at Princeton and Joe Silk at Harvard. I also met Peter Strittmatter who was spending a year at Princeton on a fellowship for Cambridge students to spend a year at Princeton. I had a pleasant meal with Phil and Sheila at their house before taking the bus back to New York. The Dilwalis arranged a banquet-like meal while I was there so that I could meet some of their friends, especially Dr Pilotz and his family.

As I boarded the plane back to London, I had a feeling that the year that had just started was going to bring important changes in my life.

## AN UNPRECEDENTED WELCOME

MY stay in King's for the second half of January 1965 was more for getting all my things together for the Indian trip. The detailed itinerary for my visit had been chalked out by the hosts Indian Council for Cultural Relations (ICCR), whose headquarters were in Delhi. Mr Inam Rehman was the Director of ICCR who wrote to me on various issues arising from my trip from time to time. The visit was to begin from Delhi and end in Delhi. On the way back I had thought of stopping in Greece for a few days as I had not seen that country before. Accordingly, I had asked Air India to route me on the return journey.

Before starting on what was to prove an epic trip for me, I had to deliver an informal talk on gravity in a students' get together arranged by the lay Dean of King's. The talk entitled 'The Lighter Side of Gravity' went off well and generated good discussion. Many years later, I was to choose this as the title of a popular book on gravity that I had written.

There were a number of social engagements in this crowded fortnight as recorded in my letter home dated the 22<sup>nd</sup> of January. I had called on Mr Thatcher, had the Sunday lunch with the Cunninghams, dinner on Tuesday with the Lapwoods, dinner on his birthday hosted by Chandra which had Anant, Raj and Chandra's younger brother also, as invitees etc. I had invited Morgan for dinner and had hosted a dinner in A4 for Sverre Aarseth and his wife Patricia as well as Brent Wilson.

As a prelude to my forthcoming visit, I received a cablegram from the Government of India, New Delhi, congratulating me on my being selected for the Republic Day Award of *Padmabhushan*. This news was very heartening, if not surprising; because about ten days earlier I had received a letter from my father stating that he had been asked by the President's office if I would accept this award if selected for it. I believe, it is customary to seek the prior consent of the awardee to avoid any embarrassments. Since there was no time for consulting me abroad, my father had replied on my behalf that I would be honoured by this recognition, as I indeed was. Accordingly, on the 26<sup>th</sup> of January, my name figured in the list of Republic Day honours.

My visit to India started with the Air India flight 522 to Delhi. The plane landed on time around 1 a.m. on the 1<sup>st</sup> of February, and my parents as well as one Mr Thomas Cherian, an old acquaintance from B.H.U. and a representative from the ICCR were present. My parents were staying in the Rajasthan House on Prithviraj Road, but my accommodation was booked in the five star Ashok Hotel. Although I would have liked to be with my parents, it was felt that the existing arrangement should continue as there were many visitors and press people coming to see me the following day.

My first morning on the Indian tour was deceptively light. Perhaps, because it was a Sunday. After a relaxed night at the hotel, I had a breakfast and then went to see my parents at the Rajasthan House, which was largely for the use of government officials and politicians from the state of Rajasthan. My only appointment along with my parents, was for lunch in the house of the ICCR Director Mr Rehman. In the afternoon, there were a couple of press interviews and in the evening my parents and I were to take the Delhi Mail for Ajmer.

The lunch at the Rehman house was very pleasant. Mrs Rehman (nee Haldipur) was from Kolhapur and knew many persons from there that my parents knew. So they had a lot to talk about. Mr Rehman gave me the detailed itinerary that I was to follow. I had already been sent a broad time table of my trip, but this one indicated the lectures I was to give. (I had earlier communicated a few topics for my lectures, from which these were chosen.) Most places were university campuses and other public institutions. I asked why B.H.U., my *Alma Mater* was not on the list. I had already received many requests from there for my visit. Mr Rehman said that he would try to fit it in on the way back from Calcutta to Delhi, provided I did not mind extending my visit by a couple of days. I agreed to this proposal. Mr Rahman explained that on my

return to Delhi from Ajmer, I will be expected to deliver talks round the country and meet some important persons.

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Thus on the evening of February 1<sup>st</sup>, my parents and I boarded a First AC carriage on the Delhi Mail for Ahmedabad. This was the same train that we had used in 1960 for going to Ajmer. On that occasion it had been late by several hours, because of some accident on the track. This time it arrived in Ajmer on time. There were several dignitaries to receive me, partly because my visit was ‘official’ and partly because my father enjoyed love and respect amongst the local intelligentsia.

I had a relaxed 6-days stay in Ajmer, when I went round with my parents on car drives to their favourite spots in the countryside and also met some friends and acquaintances. My lecture was arranged in the local Government College and I was surprised to see a large audience. Indeed, I came to discover that this would be a common feature of all my talks on this trip. I had designed my talk at the level I would have given to a general undergraduate audience at Cambridge. After looking at the general composition of the audience, I decided to dilute it considerably. I was required to do so at all my talks on this lecture tour.

I was also felicitated by the Maharashtra Mandal, Ajmer. There was a sizeable Marathi speaking community in Ajmer and they were proud of me being a native Maharashtrian. There were autograph hunters too, and here my father made a very pertinent point. He said that one should give one’s autograph only in an autograph book or in one’s own authored book. In the excitement of the moment after a lecture children in the audience produce any slip of paper for an autograph. Signing such ‘chits’ should be avoided since they do not do justice to the dignity of an autograph.

Soon my six days’ rest were over and I had to get ready for the talks all round the country. Thus in the tour ahead, I was to start at Delhi, then proceed to Ahmedabad, followed by Bombay and Hyderabad, then Bangalore and Madras, followed by Calcutta. From Calcutta I was scheduled to fly to Delhi, but this might change if Banaras was added in between. So my trip started one evening, when I boarded the Delhi Mail at Ajmer and proceeded to Delhi.

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On arriving in Delhi, I was again put up at the Ashok Hotel. And I discovered

that my visit was going to be a high profile one. Already some newspaper articles had appeared about me since my arrival in India. By delaying my trip by a few months since the celebrated presentation of our work at the Royal Society, I had hoped that the publicity given to the event in June would have died down by now. I found that it had not died down but had remained dormant, ready to be revived now.

In Delhi I was scheduled to meet two VVIPs: Prime Minister Lal Bahadur Shastri and Education Minister M.C. Chhagla. The meeting with Shastriji was in his office in the South Block. I found him a very simple and warm personality, if a little shy. He expressed great pleasure that I had agreed to visit India on this lecture tour and hoped that my talks would inspire some bright youngsters to emulate me. He then asked what my long term plans were. I explained that I was engaged in very absorbing research work in Cambridge with Professor Hoyle and for the next 3-4 years I would like to continue there. I had plans of returning to India, however, I added. Whereupon he said that as and when I felt that I was ready to return to India I should write to him and he would ensure that conditions conducive to my productive research would be created in a university or an institute. I was greatly reassured by this promise from the highest authority in the country.

My interview with the Education Minister was also equally friendly. Mr Chhagla was very appreciative of my desire to return to India to continue my work at a suitable time and promised that if I wished to return to work in a university he would create a suitable position for me.

Apart from these important interviews, I had requested time to call on President Radhakrishnan to pay my respects. Dr Radhakrishnan had all along taken interest in my career, helping it wherever required with advice or action. My father deeply respected him from his personal interaction at B.H.U. Time was allotted for me to call on him one afternoon. My father had told me that very often because of his very low blood pressure, Dr Radhakrishnan had to lie horizontal rather than sit up or stand for long. I found him in the reclining posture when I entered his room in the Rashtrapati Bhavan. We had a fine chat for about ten minutes during which he presented me with a signed copy of the *Bhagavadgita*, with his commentary in English. This has been a cherished possession with me.

In addition to these commitments, I gave a short talk at IIT, Delhi and had meetings with the officials in the Education Department and the CSIR. My talk at the National Physical Laboratory had the 1000-seater auditorium full to capacity.

Mr Hazarnavis, who was a minister in the Union cabinet and whose son Charu I had met in Leeds, invited me to lunch where he also invited the Prime Minister and Mr T.T. Krishnamachari, another minister. The occasion was supposed to be private and informal, but as my host told me after the PM left that the lunch arrangements were taken over by the cooks of the Prime Minister which happened as a matter of security. So he felt that I did not have a sample of his hospitality and arranged another lunch at his place on the day I left Delhi for Ahmedabad!

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My next halt was in Ahmedabad. Gujarat University was the local host, although I was a personal guest of Vikram Sarabhai. My public lecture was held in ATTIRA auditorium, which had been a creation of Vikram Sarabhai. Again I went through the 'dilution' exercise to get down to the general comprehension level of the audience. I was in a way getting practical lessons on how to express science to a lay audience.

I visited PRL and Vikram Sarabhai renewed his earlier invitation to visit PRL, besides sharing with me his excitement with the emerging space programme at Thumba in Kerala. These early efforts have now grown into a mammoth of a space programme which has several achievements to its credit. At Ahmedabad I also had a pleasant meal with Manorama Sarabhai, mother of Anand Sarabhai. Anand was also present and we had a pleasant chat about Cambridge where I had first met Manorama.

I was pleased to see that amidst these vast adoring crowds, there was a small group which was interested in critically examining my work on gravitation theory. Professor P.C. Vaidya at Gujarat University Mathematics Department and some of his students met with me to discuss their comments and doubts. I found this session far more satisfying than the public accolade I was getting, which I felt was premature and undeserved by me.

The Registrar of Gujarat University was with me on the evening I was to leave for Bombay. After dinner at his place, we went to the airport, only to find that the flight to Bombay was indefinitely delayed, because of some technical fault. The flight had not left Delhi and after it left, it would take at least an hour and a half to reach Ahmedabad. The Registrar therefore suggested that we go back to his place and have a chat there. After enjoying his hospitality, I asked to check with the airport for the status of my flight. There was no change! This went on for another two hours after which we were told that the flight

had left Delhi. Anand Sarabhai then took it on himself to take me to the airport and we went there at hour and a half past midnight. We chatted for a while till the plane showed up. I eventually reached Bombay at around 2.45 a.m. Mr Mehta, the ICCR representative was there with a driver and car to take me to the Taj Mahal Hotel. He had been waiting for my flight all along and mentioned that several dignitaries had come to receive me at the scheduled time but had dropped off one by one as the flight got more and more delayed. One dignitary was the renowned literary figure turned journalist and politician P.K. Atre. Dadamama and his family, however, were also patiently waiting for me and I suggested to them to visit me at a convenient time at the Taj Mahal Hotel.

PK. Atre, or *Acharya* Atre had a soft corner for me. In 1963, he had arranged a special function to honour me even before this present wide recognition of my work. He had wanted to arrange a public reception for me on an even grander scale on this present occasion. However, because of my very tight and strenuous programme, the ICCR had (rightly) told him that there would not be a time slot for such a programme during my Bombay visit. I assumed that he may have come to the airport to see if there could be a rethink on that ‘no’.

At that late hour, I was very relieved that there were no reception committees around at the airport and was glad to turn in for a three to four hour sleep in my hotel bed. My next programme was at 10 a.m. in the Institute of Science, where I was to address the students. Pleading lack of sleep for any incoherence in my speech, I recall telling them the story of the peer in the House of Lords who dreamt that he was speaking in the House and woke up to find that he really was! I was actually very pleased to have the chance to speak at the Institute because it was here that my father’s name appears first in the Roll of Honour as the student who performed best in the university examination. Other names to follow are those of Homi Bhabha and B.M. Udgaonkar. Sadly, the Roll does not have any recent names.

I recall that I had gone to the National College, Bandra for a talk and also gave talks at Bombay University and the Tata Institute of Fundamental Research. The Bombay University talk was held in the Senate House which boasted of a large capacity of audience. However, it proved inadequate and was overflowing with rows of standees. The lecture was to be presided over by the TIFR mathematician, K. Chandrasekharan who apparently failed to show up. So the organizers requested veteran mathematics Professor and retired Principal of Elphinstone College, K.R. Gunjikar to preside. He did that very well and

I was very happy to meet him, having heard a lot about him from my father. The mystery of the non appearance of Professor Chandrasekharan was solved later: he had indeed come to the auditorium on time, but could not get in through the crowd.

I was getting somewhat upset by the large crowds turning up for my lectures. Not that my ego was not boosted by this adulation; but rather I found the demonstration of respect and affection quite out of proportion to what I had achieved. Apart from the large crowds, I was receiving invitations to programmes like public receptions to honour me. Such programmes would further eat into my time and energy. Soon after this talk, I wrote to Vasantmama in Pune expressing my growing ‘nervousness’ over the developing situation and sensing something of a crisis, he rushed to see me. He came by the Deccan Queen and we had lunch together. My proposed reaction to ask the ICCR to terminate the tour was dismissed by him as a panic response to the situation. He suggested that I could be firm in refusing any ‘non-academic’ invitations that came from outside the ICCR programme on the grounds that I was too preoccupied and tired. He cited examples of visiting scientists refusing additional invitations firmly. As for the crowds turning up, he asked me to bear with them as this was a unique example of a scientist (rather than a movie star or a sports personality) being mobbed. “Look upon it positively as an instance that may motivate youngsters towards academic careers” he added. I found his advice very sound and practical.

My colloquium at the Tata Institute was expected to be really technical and I had decided to keep it so. I was told that being far away in Colaba I would not have crowds turning up. Besides there were restrictions on entry to the Institute. But when I entered the colloquium hall, it was again overflowing, so much so that M.G.K. (Goku) Menon (who was officiating as Director and chairing my talk, in the absence of Homi Bhabha who was out of station), had to stand. The mystery of this large crowd was solved when I was told (years later!) that the non-academic staff had requested that they be allowed to attend my talk as this was their only chance of seeing me. And in a rare case of this kind their request was granted.

But my first visit to TIFR left me greatly impressed by its ambience. I had never seen a research institute so beautifully built and sited on a very pleasant sea shore far from the madding crowds. I was invited to a lunch in the Faculty Lounge on the top (fourth) floor and found the views from its large windows quite stunning. Amongst the senior faculty present, I recall meeting Menon, Yash Pal, Roy Daniel, Devendra Lal and Bhalachandra Udgaonkar.

When I do return to India I must give the idea of joining TIFR a serious consideration, I said to myself.

I had some spare time too for sight seeing and for meeting friends and relations. Thus Dadamama and his family dropped in to see me and more importantly, the insides of a major hotel like Taj. I dropped in to see 'Vyas mama', that is Pandit Narayanrao Vyas who was as usual in great form in telling anecdotes. I also had a meal with the Agashes, with Dadamama's family and with Morumama's family. Another friend of my father on my visit-list was Nana saheb Puranik and his family in Girgaon.

Calling on Mrs Vesugar was a must of course and I had a pleasant lunch in her cabin. She was extremely pleased with my progress and informed me that of the outstanding loan amount of around Rs 3000 or so, all but Rs 500 was being waived by the Tata Endowment. She felt that it would be a good gesture on my part if I paid that small but remaining sum off myself rather than rely on my father who had been paying back the loan instalments till then. I did as she had asked. She also asked me to 'talk down' to the Cambridge Society of Bombay who had invited me to dinner and a lecture afterwards.

I was also accorded a civic reception by the city in a simple ceremony held on the picturesque Malabar Hills. There was an amusing faux-pas by one of the speakers who was asked to introduce me. Instead of describing me as having 'padmabhushan' he called me 'bharathbhushan' which also happened to be the name of a movie actor who was quite popular those days!

The ICCR representative also took me for a ride in the National Park area and the Aarey Milk Colony. I ran into Arun Mahajani near Dadar by chance, and he suggested going for a visit to the Elephanta Caves. Dr Talwalkar also happened to be around and joined us on this trip the next morning. It was a very enjoyable trip, except for the sorry state of public conveniences we ran into in that tourist spot. Even today we rarely see major tourist spots in India served by clean public facilities.

With Arun around, there was bound to be an invitation to a meal. He invited us to join him in his aunt's house for dinner. The Altekars lived in Dadar and my family used to know them very well: indeed the late M.D. Altekar, a literary luminary, was a close friend of my father. So I had no hesitation in accepting this invitation.

Manohar Altekar, M.D.'s son, was also a friend of Acharya Atre and we found him at the Altekar house at dinner. He was angry that his invitation was not accepted by the ICCR. I tried to mollify him by saying that even before all the present publicity attached to my name, he had recognized my talents and

honoured me and I greatly valued his appreciation. He cooled down and talked about the possibility of meeting me in Cambridge later in the year.

One happy association of this trip with Arun was, as I came to learn later, he got engaged to Sadhana Joshi a medical doctor, while on this trip.

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My next halt was in Hyderabad where I was due to talk at the Osmania University. I was accommodated in the VIP room of the newly built guest house of the University and the Registrar personally saw to it that I got everything I needed to make my stay comfortable. Osmania has an astronomy department and so I hoped to meet some astronomers here. Dr Karandikar, the Head of the Department was there and I had a nice chat with him. He showed me the mirror and other components of the 1-metre telescope that had just been delivered and were awaiting the task of putting them together. In India these maintenance problems assume greater magnitude than in the West, and the 1-metre telescope has always been troubled by various problems.

The most significant event in the Hyderabad trip was my public talk. It was anticipated that there would be a good turnout; but not to the extent that actually happened. The biggest auditorium in the University was woefully inadequate and the last minute decision was taken to hold the talk in the landscape garden! So there was no possibility of showing my slides and I had to improvise on the spot. I began by saying that like Newton's inverse square law, there is an inverse number law which states that the larger the audience the less difficult or technical the lecture has to be. Anyway my attempt seemed to have succeeded and even today I run into people who recall with pleasure having listened to my talk in the landscape garden.

In Hyderabad, I was on the look out for Naresh Chand, my undergraduate contemporary from Cambridge. He was running his father's printing firm and spared his time to take me around the landmarks in Hyderabad and neighbourhood, like the Golkunda Fort with its remarkable acoustic signalling system. Another old friend from Cambridge whom I ran into here was Ranga Kolhatkar, working in the Regional Research Laboratory. He had married Dr Kishor Shrikhande's sister and I had a lovely Marathi meal at their place.

The flight from Hyderabad to Bangalore was a short one and I was met by the local ICCR representative as well as many other local dignitaries. My lectures were arranged in the Indian Council for World Affairs and the Indian Institute of Science. Both were attended by overflowing audiences. Police had

to be called to control the crowds as those who could not get in were justifiably annoyed. After the first lecture, I met Professor Dasannacharya who had settled in Bangalore after his retirement from BHU and whose younger son Anantha (aka *Papu*) had been my class-mate all the way from the first standard to the B.Sc. classes. Anantha's elder brother Srinivas (called *Cheena*) was also in Bangalore and it was a pleasure to meet them all. At Professor Dasannacharya's suggestion, we had a picnic at Nandi Hills, some 40 miles from the city centre. The Dasannacharya family (Cheena and his parents) had accompanied me on this trip and had come provided with excellent idlees.

The lecture at the Indian Institute of Science (IISc) led to a ludicrous situation that I had not encountered elsewhere. There were big crowds of students as usual but they had been accommodated in *two* lecture halls and I was asked to give half of my talk in one hall and the other half in the other. This called for improvisation of a different order altogether; but I think I managed somehow. There were questions from the students in both halls which I liked.

My account of Bangalore would not be complete without a description of my encounter with the legendary physicist C.V. Raman. Raman had given time of 7.30 a.m. for our meeting at the Raman Research Institute which had been started by him when he fell out with the management of the Indian Institute of Science whose directorship he had enjoyed for many years. My chauffeur took me to RRI and there we found that the front gate was locked. There was a bell which I rang. An old man whom I took to be a gardener from his dress opened the gate and invited me in. Fortunately my driver alerted me to the fact that that man was Raman himself. Having been accustomed to his picture with the turban on, I had failed to recognize him without a turban and in a very untidy dress!

But we soon got on very well and in his characteristic monologues, he regaled me with anecdotes and personal impressions of various scientists and the scientific establishment. At my request he was delighted to show me his collection of gems which he had subjected to scientific (related to optics) tests. He also confessed that what was attracting him those days was the topic of physiology of vision and he was confident that he would get a second Nobel Prize when he completed his ongoing investigations in that field.

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My next stop was Madras where I was put up in the Grand Hotel. The national news a few days back had carried accounts of anti-Hindi riots in Tamilnadu.

But by the time I reached Madras things had quietened down. However, it is worth mentioning one minor incident. When I was writing a letter in Marathi to my parents, a room waiter who was curious about the script, asked if I was writing in Hindi. In some trepidation I replied that it was not Hindi but Marathi. Since the scripts are the same, I wanted to clarify (to be on the safer side!) that I was not using the language which was unpopular in the region.

In Madras, I called on Dr Lakshmanswami Mudaliar, Vice Chancellor of Madras University, who also extended to me invitation to join his university. My main lecturing commitments were, however, at the Institute of Mathematical Sciences in the Adyar area. Originally I was scheduled to give two technical seminars and the Director Alladi Ramakrishnan had planned to hold them in the institute's lecture hall which had a capacity of around a hundred. However, as crowds began to build up, he shifted the venue to a much larger auditorium and requested me to change my talk from technical to a popular one, a request I had by now grown used to. Alladi Ramakrishnan was profusely apologetic and mentioned one interesting encounter by way of explanation for the change. It seems that one senior gentleman, who had come to the lecture, on being shown the lecture room asked point blank: "How dare you arrange Dr Narlikar's talk in such a small room?"

But MATSCIENCE, as this institute was called in brief, had an academic programme in theoretical physics that was of interest to me. So I mentally put it on my list of institutions to visit when I planned a more relaxed and more academically oriented tour of India in the next year or two. For, before returning to India for good, I wanted to try a few places as a visiting scientist and so far PRL and TIFR were on my short list.

The local representative of ICCR arranged a sightseeing tour of Madras and its neighbourhood. So I was able to visit the archeological remains at Mahabalipuram and the temples of Kanchipuram. I would have liked to call on and pay my respects to Sir C.P. Ramaswamy Aiyer, who had been Vice Chancellor of B.H.U. when I was a college student. But he was not in town during those days.

From Madras I flew to Calcutta, where I was housed in the State Guest House. The entire guest house, situated opposite the Museum, was kept for me, that is, there was no other guest. There was also restricted access with lot of policemen around. I saw no reason for this security. I also discovered that the curator of the museum was none other than Suraiya's father. Mr Solaiman and his family called on me and very hospitably extended their invitation to visit, to stay or for meals at their house as convenient. I found their house a good 'hideout'

when there was the danger of ‘fans’ dropping in at the State Guest House for autograph, photograph or for just small chat. They also undertook to show me round Calcutta and did so very efficiently being ‘locals’ to the city.

So far as the academic part was concerned, I visited several scientific institutions like the Saha Institute, the Bose Institute, the Indian Association for the Cultivation of Science, the Indian Statistical Institute, etc. My lecture at the Saha Institute was presided over by S.N. Bose and was, as usual, very well attended. There was great curiosity amongst the crowd as to what Bose would do in his capacity of chairing the talk. He indeed did a very remarkable gesture. He did not speak but simply patted me on the back. This action evoked a great applause from the audience. However, after the talk, Bose asked me to sit with him and some of his students and discuss details of my work. He had studied my papers on gravitation and so came up with well-informed questions. Such examples of serious interest in my work (I had a similar experience with P.C. Vaidya) brought me far greater satisfaction than public adulation.

A few personal visits that revived my childhood B.H.U. connections are also worth mentioning. I called on our erstwhile neighbours Professor S.R. Khastagir and Mrs Khastagir who had settled in Calcutta, where SRK had joined as Palit Professor. They had been very good neighbours and encouraging elders to me and my brother. At the Indian Statistical Institute I met, after many years, two schoolfriends, Sitaram Sastry and Vishwanath (Appu) Menon. Another old B.H.U. contact I caught up with was Ghanshyam Thawani, whom I had last seen in England in my undergraduate days, now settled in Calcutta.

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The ICCR had rescheduled my programme so that I could visit my old *Alma Mater* for a couple of days. Indeed I was looking forward to visiting Banaras and the B.H.U. very much. My flight from Calcutta landed in Banaras at 3.15 p.m. and I was pleased to see many familiar faces amongst the welcoming committee. Major S.L. Dar, Registrar, had come to welcome me on behalf of the B.H.U. Family friends like Chandrama Singh, Ram Suchit Pandey and Anjaneyulu had come all the way to the airport to greet me. The earlier programme of putting me up in the Clark’s Hotel in the cantonment area was revised and I was accommodated in the University Guest House. This was much more convenient as I was able to meet so many of my old contacts still on the campus.

Thus I met my old teachers in the Mathematics Department, visited the Science College to see the physicists, had a brief reception at the Maharashtra Mandal under whose auspices I had seen and partaken in many programmes, and also had a short visit to the Children's School. The old Headmaster was still there and so were quite a few teachers from my times. I was given a rousing welcome by the students and teachers. It was while I was talking to the Head Master in private that he told me the old episode of how I missed failing the matriculation examination by one mark and instead ended up topping the merit list.

I visited Sarnath and found the area better developed but also more crowded. I prefer the way it was, in its pristine form with very thin crowds...in keeping with its original role as a place for teaching and contemplation of deep philosophy.

My public lecture in the University was held in the amphitheatre with a very large body of students. They all listened quietly and there was no rowdy behaviour for which the Northern university campuses were notorious. Perhaps in the young speaker they identified themselves.

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The official part of my ICCR-sponsored trip was to be over with a third visit to Delhi. My public lecture was arranged in a big auditorium, for by now the news of huge crowds turning up for my talks had reached the ICCR Headquarters. The lecture was presided over by C.D. Deshmukh, an erudite scholar but an ICS-professional as well as one-time minister in Nehru's government. He was perhaps alone in standing up to Nehru when he disagreed with Nehru's handling of the reorganization of the Bombay Presidency which did not do justice to the aspirations of Maharashtrians. The auditorium was so overcrowded that Indira Gandhi, who turned up just before the start of the lecture had to be accommodated *behind* the dais!

I had a session with the Department of Physics and Astrophysics in Delhi University, where I met Professor Auluck and some of his colleagues. I also delivered a talk at the department, again to an overflowing lecture hall. It was also a pleasure calling on D.S. Kothari, the Chairman of University Grants Commission and discussing with him the possibilities of my interaction with the university sector. Kothari, an astrophysicist from Delhi University had been slightly junior to my father at Cambridge and had done lot to develop the Department of Physics and Astrophysics. His role as

Chairman, UGC was also very effective in the early development of the universities. Unfortunately the momentum generated during his time was lost in subsequent years as political interference in the university campuses grew.

By the time I came back to Delhi after my whirlwind tour of the country, I was dead tired and mentally exhausted. I had still to visit Pune and Kolhapur, more in my personal capacity, but if the newspaper reports were anything to go by, I was sure to be sucked into a large number of lectures or public receptions. I had resolved by this time and so informed my parents and Vasantmama that I would stay away from such programmes. Fortunately in Delhi I was given a light schedule. I also ran into my college friend from B.H.U., Surendra Kumar Vasil who accompanied me on sightseeing in Delhi and even came with me for a movie. Also I had a diversionary visit to Agra where my Cambridge friend S.N. Srivastava hosted me and showed me round Agra, the Taj Mahal and Fatehpur Sikri. I could not, however, avoid giving a lecture at the University.

Finally, I had one important interview with Dr Hussein Zaheer, the Director General of CSIR. Dr Zaheer said that my current visit did not get me to interact with real workers in my field and he would be pleased to arrange another visit the next year when I could spend time with such groups round the country. I readily agreed to this proposal and promised to write to him about possible dates.

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With the main part of my tour over, I needed rest and relaxation to recover from the busy and literally 'crowded' schedule that I had followed for a month or so. Accordingly I returned to Ajmer for a few days. But here too some unavoidable commitments did pursue me. For example, the Chief Minister of the State of Rajasthan had expressed a desire to give a dinner in my honour. The venue was shifted from Jaipur to Ajmer to suit my convenience and the CM gave a dinner at the Circuit House. All distinguished persons in the town (and some from Jaipur) were invited for the dinner set out on the lawns. It was a sit-down dinner and there was a speech made by the CM, with me replying. It was a pleasant occasion and I was touched by the affection shown to me, which was also an indication of the respect and popularity my father enjoyed in the state.

I had to visit Jaipur nevertheless, as Mr Mohan Singh Mehta, the Vice Chancellor of Rajasthan University, Jaipur, would not take a 'No' to his invitation to address students in his university. This talk followed the by now

set pattern of big crowds overflowing the auditorium. Mr Mehta was very hospitable and he being a good friend of my father, I enjoyed his personal attention.

My relaxation came through the evening car rides and days spent in reading and in siestas. I was reasonably back to normal and ready to face more crowds in Pune and Kolhapur. We three made the trip to Maharashtra, travelling by train via Ahmedabad. The Delhi Mail brought us to Ahmedabad in time for the Gujarat Mail to Mumbai. From Mumbai my parents went ahead and I followed later. I recall taking the Deccan Queen to Pune and travelling with one other passenger in the compartment, Anand, the second son of Nana Saheb Puranik. I was due to stay with Vasantmama and normally I would have got down at the Kirkee station, where the train used to make a brief stop before the Pune Terminus. However, Vasantmama had asked me to get down at Pune station. Anand hazarded a guess that there would be people waiting to meet me at the Pune station. At this stage an irrational desire came to my mind: Why don't I get down at Kirkee and make my own way to the University? I voiced it to Anand, who discouraged me from taking that action saying that it would disappoint all those who had come to the main station to welcome me.

Better sense prevailed and I remained in the carriage as the train rolled into the Pune station. I was taken aback by the throng present there...there was no room for anyone on the platform, filled to capacity as it was with people. I spotted Vasantmama. Prabharami and little Snehal in the crowd and waved at them. I was greeted and garlanded by the Mayor of Pune and several dignitaries and academics from this city with educational traditions. After receiving a large number of garlands and bouquets from the welcoming citizens of Pune, I was put into an 'official' car which had been assigned to me during my visit. Vasantmama and his family also got into the car and we pulled out of the station after bidding good-bye to all those present.

It was a relief to be back in quiet surroundings as we reached the VSP house in the university campus. I immediately started making friends with Snehal whom I had last seen when she was barely a year old. Now she was over two years and speaking and walking around. Vasantmama had been given a temporary phone at his residence so that I could be in touch with outsiders who wished to talk or interact with me. He gave me an itinerary of my visit. This involved two lectures in the university, and two in the city...in the Fergusson and Sir Parashurambhau (SP) colleges. The city of Pune wanted to honour me with a civic reception. Also, there would be sightseeing trips like one to Simhagad fort.

I was a bit overwhelmed by the idea of a civic reception. I had one in Bombay and now I was having one in Pune. What had I done to deserve these honours? So far as my own assessment was concerned I had performed reasonably well in my field and was getting some recognition by peers. But in no way my self assessment put me in a class which called for so much public accolade. At the actual ceremony, I said that including my name in the same class as Newton and Einstein was like the rule of the grammarian Panini who placed together (from the grammar point of view) the three words meaning ‘a dog’ (*Shva*), ‘a youth’ (*Yuva*) and god ‘Indra’ (*Maghava*).

My lectures in Fergusson and SP were extremely crowded. The aged Senior Wrangler R. P. Paranjpye was chairing my talk to an overflowing amphitheatre at the former, while at the latter place the organizers estimated a turnout of around five thousand in an open air setting. Like my talk in the landscape garden in Hyderabad, here too the organizers at SP, seeing the turnout at Fergusson, wisely opted for an open air venue. A local newspaper giving a graphic account of the lecture reported excerpts of conversation between R. P. Paranjpye and one of his friends (who were sitting in the audience):

Friend: “Sitting out in the open is indeed pleasant, and not stuffy as in the crowded lecture hall. Only you will have to contend with the chirping birds...”

Paranjpye: “Well, even the birds have come to listen to Narlikar. They will be quiet when he starts talking...”

I certainly found the open air experience more pleasant, although I had to do away with use of my slides.

The visit to Simhagad was very memorable. At the bottom of the hill having the fort on top, there is a village. As our cars came to pass through the village, we were stopped by a group of villagers. Apparently they had heard about a young scientist of great achievement passing through the village and the village wanted to honour him. I was pointed out to them and they did an arati and gave me a coconut besides garlanding me. I was very touched by this gesture. After all, why should the villagers most of whom had not had any formal education feel the urge to honour a scientist? But they did.

After Pune my parents and I moved to Kolhapur where also I had a big crowd to welcome me at the railway station, including the town bigwigs. We were accommodated in the circuit house and were well looked after. There was a civic reception here too. But with an added feature. A few days earlier, I had received a phone call from Dayanand Bandodkar, Chief Minister of the centrally administered territory of Goa, inviting me to visit Goa. At that stage my

time-table had become supersaturated by visits and lectures and there was no time to accommodate a Goan visit. Much though I would have liked to take advantage of this invitation to visit this scenic part of the country, I had to decline the invitation. But the CM found a way of honouring me without my visit to Goa. He learnt that I was visiting Kolhapur and so sent one minister in his cabinet, Shri Karmali, to attend the civic reception for me and there to present me with a magnificent Goan brass 'samayee' (a lamp) on behalf of the people of Goa. This was a very kind gesture and again I was overwhelmed by the affection I was receiving from unexpected quarters.

The Kolhapur visit also included time spent with my relations, having meals with them, going round the countryside with them and simply chatting with them on various topics under the Sun or beyond it (as I was an astronomer!).

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I wound up my visit in mid-April after spending some time at Ajmer before leaving for abroad from Delhi. On the way back, I had arranged to stay and do some sightseeing in Athens. This was duly accomplished and I was able to see some highlights of Greece, a country rich in history and culture. For me Greece was romantic for the epics of Homer, for conquests of Alexander, but even more interesting as the land of Archimedes, Aristarchus, Aristotle, Hipparchus, Ptolemy, a string of scholars who added so much to our understanding of nature.

I missed an important event, the award of the Padmabhushan to me by President Radhakrishnan of India. The award ceremony was scheduled a month after I was due to leave and I received it by post, as is the custom in such cases. But my trip through India itself was a big award to me. I do not think any other scholar or scientist has had such a tour full of spontaneous rousing welcome with signs of affection at the individual and collective level. There have been many countrymen of mine whose achievements have far exceeded what mine were at that time. But why I was singled out for this extraordinary demonstration, will remain a mystery to me. As I said at the time, I regarded these accolades as 'on account', meant to be deserved later in the course of my life, through far greater achievements. Only history will decide whether this happened.

## WHEN TWO HANDS BECOME FOUR

THE flight from Athens landed in Heathrow in late morning. As I cleared the immigration and customs and emerged with my baggage, I was met by an official from the Indian High Commission. He introduced himself as Mr Nag, the nephew of Professor U.C. Nag who had been Professor in B.H.U. when I was in school. The hospitality of Government of India was continuing beyond the nation's boundaries! He had brought a limousine and dropped me at the Liverpool Street station where I got the next train to Cambridge. One major difference that I noticed since I had left England three months ago was the motorway connecting the airport to the West End. It considerably reduced the time taken from the airport to central London.

Fred was away in the Lake District when I called the next day at 1 Clarkson Close, with gifts from India. Both Barbara and her mother very much liked the items my parents had sent for them. I learnt that the next international conference on relativity and gravitation, after the Warsaw meeting of 1962 was scheduled to be held in London in July and that Hoyle and I were to present invited talks on our theory in the July 7 session on alternative theories of gravitation. We had new stuff to present, arising out of our recent work. In particular, we had worked out replies to the criticism levelled at our theory by two relativists Felix Pirani and Stanley Deser. We felt that a talk centred round this theme would be opportune.

Meanwhile my get togethers with Anant, Chandra and Raj continued, including dinners in restaurants or in one-another's rooms, going to theatre

or cinema or exploring the countryside. My occasional visits to the Salt house went on. I had taken special Indian tea for them, knowing that they were connoisseurs of tea. They were very appreciative of the gift and henceforth I made it a habit to bring for them special tea varieties from India.

Anant Rajwade and his wife Nirmala, Jamal and Suraiya were others from our subcontinent whom I used to see and often all of us found ourselves in the house of Mary Wraith, usually for after-dinner coffeee and cake. She introduced me to Mr Bill Coates who was very fond of Indian classical music. He was a fan of Anant Rajwade and greatly admired the ragas he played on his sitar. Coats had a small daughter Nora, whom he wanted to cultivate Indian music. So he requested Anant to do his daily 'riyaz' in front of Nora, in the expectation that as the child grew up she would come to appreciate Indian music. I do not know whether the experiment succeeded. Coates also got my help in translating a Hindi book on the historical traditions of Indian Classical music, which he later published. I spoke out the translation from Hindi to English, and I recorded it on a tape. Coates transcribed the taped words into a written format. However, I never saw the published version.

Whenever the weather permitted and we had time to spare, some of us would punt on the river. Brent Wilson and Sverre Aarseth would join Chandra, Raj and me to take part in the experience. My tutor at Fitzwilliam, Norman Walters was my guest at the King's feast in May. I had invited Bill Williams and Peter Schneider to these feasts in earlier years.

One important encounter I cannot forget: Fred Hoyle called on Morgan Forster for a tea-time chat in early August. I had been instrumental in bringing them together and I wish that I had set a tape recorder in the recording mode while they talked. For they exchanged views on various matters, on science, religion, philosophy and sociology.

I avidly watched the Bertie and Jeeves series on the television, since I retained my great liking for Wodehouse books. Every year a new Wodehouse book would come on the market and I would buy it, later sending it to my father from whom I had acquired my Wodehouse-mania. I also recorded an interview of P.G. Wodehouse by Malcolm Muggeridge on the BBC.

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In late May, I had a pleasant visit to the Isle of Man where Arun Mahajani had invited me. He was now happily married to Sadhana whom he had met when we were both in India in February. So this time I was to enjoy the hospitality

not of a bachelor but of a married couple. The lavish Mahajani tradition had continued and I thoroughly enjoyed my visit. This included a visit to the Casino, where Arun laid a small bet and won some money! I also watched an operation being performed by Arun and his boss, the consultant surgeon Mr Vernon. We drove around the island and weather permitting saw the local scenic attractions.

In late June, Chandra, Raj and I were planning a tour of the Rhine Valley in Germany. This was in response to the invitation of my B.H.U. College friend Gurbaksh Singh, who was then working in Köln (Cologne), Germany. He said that if we come to Cologne, he would travel with us down the river Rhine. We accordingly turned up at Cologne. However, when we came out of the railway carriage, we were met by some local friends of Gurbaksh with a shocking news. While on the way to meet us, he had got seriously hurt in a car collision and had just been admitted to a hospital. We went to see him and found that although suffering from many injuries, he was going to be OK. As he could not travel with us, he had requested his friends to show us round some picturesque villages in the neighbourhood, which they did. They also advised us on how to plan our itinerary for the Rhine cruise. Then we were on our own and as advised, went from Cologne to Bonn, and then by steamer down the Rhine. We also went along the Mosel for some distance. The scenery was really breathtaking and as we had gone before the tourist rush of school holidays, we could take our time and choose our hotel to stay without any botheration of advance booking. We went as far as Heidelberg, before turning round. We then went by train to Liege and then to Brussels before returning to England. While in Brussels I was reminded of my fantastic time there in 1958, as the guest of the Mercier family.

Unlike the Warsaw meeting on gravitation I attended the London meeting only on two days, making day-trips from Cambridge. The presentations by Fred and me were received well with a lot of discussion from Bergmann, Hoffmann, Chandrasekhar, Wheeler, Misner, Deser etc. Willy Fowler was chairing the session and there were around 300 in the audience. Of the delegates, P.C. Vaidya and John Bahcall visited Cambridge and I showed them around including taking them as High Table guests.

A somewhat unusual visitor to Cambridge was Acharya Atre. Chitre and I were in London for some day visit and our programme included brunch at an Indian restaurant called *Sharuna* on Tottenham Court Road. We had learnt that the Maharashtrian/Gujarati snack of *bhel* was available there. Since we had not eaten *bhel* for many years, we had specially gone to Sharuna for it. As

we were absorbed in consuming the ‘delicacy’ a heavy hand fell on my shoulder. I turned round to look into the smiling face of P.K. (Acharya) Atre. He greeted me in his usual bonhomous fashion. Seeing what I was eating, he exclaimed: “Jayantrao, you come all the way to London to eat *bhel!* I had a typical bacon and eggs breakfast in my hotel”. I replied, “Sir, every one eats with relish what is a novelty to him.” He said that he was planning to visit Cambridge and would like to meet me on my ‘home ground’. I invited him for a visit and he came a few days later. I gave him my usual half-day Cambridge trip and we ended it with a late lunch. He was very impressed by the place and wrote graphic accounts of his visit in his paper *Maratha*.

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As the year rolled by, I made progress on my next visit to India. The CSIR invitation from Hussain Zaheer had materialized and I had planned to spend two weeks each at PRL, Ahmedabad, Matscience, Madras and the Department of Mathematics and Statistics in the University of Pune. None of these places belonged to the CSIR group of laboratories; but Dr Zaheer was broadminded enough to host my visit in these places where my lectures would generate the most benefit. I did agree to his request of giving a popular lecture in a CSIR lab like the National Chemical Laboratory in Pune and arranging a workshop on relativity at the National Physical Laboratory in Delhi.

When should this visit begin? This was decided by an invitation I received for a conference in Miami Beach, Florida on a topic very similar to the Texas meetings in Dallas and Austin. (1965 being the ‘odd’ year, there was no Texas meeting scheduled.) The meeting was in mid-December and I flew from London with the arrangement that on my return, I would take the flight to Mumbai from London. So I deposited my heavy bags in the left luggage at Heathrow and travelled to Florida with only hand baggage. The weather on my day of departure from London was very bad with a thick blanket of fog. My flight on Air India to New York was cancelled, but I was placed on a TWA flight which left some five hours late. When I landed in JFK, New York, an Air India representative met me and put me on the next available flight to Miami. I reached my destination around midnight. When I was clearing through the US customs at JFK, the officer saw the address I was headed for in Miami Beach and asked jocularly: “Are you a Maharajah?” Evidently my conference was arranged in a big hotel in a luxury resort!

On my way back from the conference, I stopped for three days in New

York with the Dilwalis. Charat had just recovered from an operation and was at home. But they both entertained me lavishly. On this occasion also they invited a group of friends for a dinner party.

The next day I flew on Air India to London. My next flight was on another Air India flight to Mumbai which I would board with all my luggage recovered from the left luggage. Since I was travelling First Class on this flight, the airline booked me in a hotel near the airport for the few hours gap. I had a feeling that this visit to India was going to bring a major change in my life. But before describing it I will turn to another parallel development that was also to influence my future career.

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I had been anxiously following as a bystander, Fred Hoyle's campaign to establish a new institute of astronomy in the Cambridge campus. The early attempts in 1964 had failed and an astronomy centre had been created in the new University of Sussex. With its old traditions in astronomy dated all the way to Isaac Newton, Fred felt that an institute of theoretical astronomy should rightfully be supported at Cambridge. When the attempts to get 100% government support failed, Fred turned to private sources. He received an encouraging response from the Wolfson Foundation for a building to house the institute and from the Nuffield Foundation to pay for its running for the first five years. There were two questions still to be answered: one immediate and the other arising in the future.

The immediate question was: where shall the institute be housed? It needed a plot of land for the Wolfson building. The deferred question was: what will happen after the first five years when the Nuffield support ran out? The former question sent the ball in University's court. After some lobbying, the University agreed to acquire land belonging to Trinity College, adjacent to the Observatories on Maddingley Road. This was admittedly far from the hub of physics and mathematics activities which then were centred around the Cavendish and the Arts School. But the location as such was quiet and pleasant and Fred closed in on the offer.

Regarding the second question, Fred had a somewhat detached view: if the new institute were a success, there would be no difficulty five years hence to find support for it. The UK Government was sure to step in and continue it. If the institute were not a success, the question of continuing it did not arise. In short, he adopted a "swim or sink" policy. So it now lay with the university to take a step regarding giving statutory support to this proposal.

As all major decisions in the university are taken in a democratic way, the University published in its reporter, a detailed proposal for setting up an autonomous Institute of Theoretical Astronomy. As per the usual practice, this proposal would be in circulation for a few weeks, then discussed at a public meeting and, depending on the response, modified and then presented for a formal vote or withdrawn.

The general response from the Cavendish physicists to the proposal was sympathetic. The overall academic community in Cambridge was neutral, if not for the idea. The real problem lay in how the DAMTP, especially its head George Batchelor would view it. This was to be clear in the discussion before all members of the Regent House (that is the academic body of the whole university). Accordingly both Fred and I attended the meeting held in the Senate House.

A number of speeches were made, some in support, some suggesting minor changes and some suggesting that the idea of such institutes or centres may be extended to other academic fields. Then George rose to speak. He welcomed the setting up of the institute, which reflected the past traditions of Cambridge in astronomy and the current enormous growth of the subject. He was, however, of the opinion that the institute being a research institute, must concentrate on research alone and as such its staff members should not be called upon to lecture in the University's Tripos teaching programmes. This was the major point he made apart from a few minor comments.

I was surprised at the mildness of the speech and its main suggestion which seemed to free the staff members of the burdens of teaching. Certainly, as a post-doctoral fellow, I was happy to learn that if appointed to the Institute's staff, I will be left free to do my research. I mentioned this to Hoyle, who however, somberly shook his head. He had not liked Batchelor's suggestion. "By deleting teaching duties from the Institute staff, Batchelor has ensured that the Tripos students, which include the cream of young intellect, will be kept away from the staff. The result will be that we may not be able to attract them to our Ph.D. programme." So Batchelor had thrown a googlie, and it would take the Institute many years to get over the problems created by his suggestions. The DAMTP was in a prime position to attract the best talent from amongst the bright Tripos students. I recalled that both John Faulkner and I were attracted to work under Fred because of his lectures. Lectures link students to the teacher and an excellent teacher can inspire students to do research. I will have occasion to belabour this point later in this narrative.

That astronomy was entering a very dynamic and expansive phase was seen from the new avenues that were opening out. The promises of space technology to astronomy were on the way to being fulfilled, with satellite borne telescopes in X-rays, ultra violet, infrared, etc being proposed for observing from high above in the atmosphere. There were the new generation of electronic computers in the offing to solve astronomical problems hitherto considered unsolvable. The discovery of quasars had shown how multi-wavelength astronomy can yield new unexpected information. Fred was playing a lead role as idea generator as well as science communicator. In a more modest way I too found myself drawn in the latter role.

I had been writing articles on astronomical topics in the popular science journal *The New Scientist* after my successful effort for *Discovery* in the previous year. I was also being invited to address undergraduate and graduate societies on popular science. One such lecture by me in Oxford (to the Oxford University Science Society) drew an audience of 500, which far exceeded the previous best of around 375, drawn by the Nobel Laureate Lawrence Bragg. This may perhaps demonstrate the interest cosmology was generating amongst the university campuses. Perhaps the reason was the discovery of the cosmic microwave background by Arno Penzias and Robert Wilson, a result which was seen as supporting the big bang cosmology. A simple extrapolation seemed to indicate that this was the relic radiation left over from a very hot dense era prevailing soon after the big bang. More so in England, this finding prompted Fred Hoyle to concede that this finding seemed to disprove the steady state theory that he had been so strongly defending. Hoyle argued that this supported an evolving universe, more like what he and I had proposed in our Caltech visit. This made news as Fred made the statement before a large audience at the Annual Meeting of the British Association for the Advancement of Science in September, 1965. The *Newsweek* magazine likened it to the problematical event of Lyndon Johnson changing his political affiliation from Democratic to Republican!

With our presentation of a new theory of gravitation, astronomy had not only gone close to the general public but also to the authorities with purse strings. Fred continued to get offers to US campuses, but his efforts to bring the proposed institute into existence were his main driving force. He finally succeeded in getting the proposal accepted by the University and then things moved very fast, with the acquisition of land and construction of the building. By the end of 1965, when I left for India, following my short excursion to the Miami Beach, I did so with the informal assurance from Fred that after the

IOTA (short for the Institute of Theoretical Astronomy) was set up, I would be sure to become one of its founder staff members. He had made similar offers to John Faulkner, Peter Strittmatter, Sverre Aarseth and Chandra Wickramasinghe.

For me this would be a major development in my career, which had to be folded in with another important step I might take. For, on this forthcoming trip of India I was to begin my own personal campaign, to look for a suitable life's mate.

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My two friends from early Cambridge days, Kumar Chitre and Jamal Islam were happily married. Kumar and Suvarna knew each other from before as did Jamal and Suraiya. For me there was no such background sweetheart and I had to do my search from scratch. I had all along wanted to marry within my culture, a girl from educated middle class preferably from Maharashtra and able to cope with life in the West. For, I envisaged spending time in Cambridge till the IOTA completed its first five years or so. My trouble was that I needed to be in India for an extended period to be able to find the bride of my dreams and this was not possible so long as I was based in Cambridge. Moreover, after the ICCR sponsored visit to India I was very well known in India and the kind of privacy one needs for this operation was denied to me. Even, this time, when I landed in Bombay, the officials at the airport in immigration and customs recognized me "as that famous scientist!"

Incidentally, as I landed at the Santa Cruz airport in Bombay I said to myself that "Operation Z" is now beginning. *Operation Z* was a name given to my search for a bride, by Jamal and Suraiya who often used to quiz me about it. In fact they had expected that whenever I went to India, I would return engaged or married. I had disappointed them in 1960, 1963 and 1965. The letter Z was taken by them as indicator of "last priority" in my overall plan for my life. Would I have something to report in 1966, I wondered as I got into the car brought by a representative of CSIR in Bombay. I was to stay at the Taj Mahal Hotel from the early morning since my arrival till early afternoon, when I would leave for my flight to Jaipur. The arrangement was that I would reach Jaipur where my parents would receive me and take me by car to Ajmer. Thus I would reach Ajmer by the evening of 23<sup>rd</sup> December.

As one popular magazine had said a few months back, I was "India's most eligible bachelor". Indeed, my parents were receiving many proposals for

my marriage. In consultation with me, they had shortlisted them to a list of four or five. I was to meet the girls, talk to them in a priority sequence, hoping that I (and the preferred one, of course) would be able to arrive at some decision after a few meetings. The first on the list was to come all the way from Bombay to Ajmer to meet me. Ironically, she was Mangala Rajwade.

I say, ‘ironically’ because there was a history behind this. Mangala was a mathematics graduate, with a brilliant academic career, which was epitomised by the award of Chancellor’s Gold Medal of Bombay University. She was a research scholar in the School of Mathematics of the Tata Institute of Fundamental Research, a position not easily obtained since it requires going through a very tough interview. With her brilliant record, it was natural for her senior family members to think of a scholar husband for her. My name had thus been at the forefront in their consideration. However, before they took any step to approach my parents with a proposal, ‘news’ somehow got round that we were engaged. The news was no more than a round of rumours since neither side had approached the other. My parents were, naturally, considerably disturbed when this rumour reached them. During my last trip in February-April, I too had been quietly asked by some friends and acquaintances as to whether this was true and I could only say that there was no foundation to the rumour. Fortunately, the rumour did not leak out to the newspapers. The matter was eventually straightened out and a formal proposal went from Mangala’s parents to mine. Later, in the autumn of 1965, my parents invited her to Ajmer and she went with her uncle (Balamama, her mother’s brother). She created a very good impression on my parents and this resulted in their placing her first on my list. Now she was invited again to meet me.

My parents expected her and her uncle (R.G. Rajwade, her father’s brother) to reach Ajmer the following evening by the Ahmedabad-Delhi mail. So my arrival in Ajmer was in time for me to be briefed about her by my parents, although they had forwarded some information and photographs earlier to me at Cambridge, as they had done for the other short-listed girls.

Mangala had lost her father Sadashiv Gopal Rajwade, himself a scholar, at a very young age, when she was barely a few months old. He died of cancer of stomach. Her mother, Nirmala Rajwade (often called Kumutai, her name before marriage) was a lady of strong character and she faced this calamity with firm resolve. She decided not to remarry but to continue her education by becoming a medical-cum-ayurvedic doctor. In this, she was supported by the families on both sides, her father’s and her brother-in-law’s. Her brother in law, Ramachandra Gopal Rajwade had married her sister Nalini and both of them assured her that

they will bring up her children (Mangala and her elder brother Anil) while she carried on her studies. So Mangala and Anil were brought up in the Rajwade house in Bombay while their mother studied in Pune.

As my parents prepared themselves to go to the station the next evening to receive Mangala and her uncle, I also offered to go along. My mother tried to discourage me, for a good practical reason. She felt that passengers do not look at their best after a long train journey and Mangala may need to freshen up before she would like to be seen by me. I, however, overruled her and said, that with me these considerations do not matter. The train was on time and we soon found our guests. I was certainly impressed by the outgoing personality of Mangala's uncle and had a good impression of her too, despite the disadvantages of a long journey mentioned before. My father had reserved rooms for them in the circuit house, where we deposited them.

The next morning, which was Christmas day, they spent the whole day with us. After breakfast, we went for a drive to the Foysagar Lake, which is not too far from the city. There is a footpath going round the lake and my father suggested that Mangala and I do the round by ourselves while he and her uncle sat on a bench and chatted. So we were left 'alone' to get to know each other better. I recall, we had a free and friendly chat about ourselves, our lives, our likes and dislikes, the common people we knew, our expectations from life, and so on. I outlined to her my plans to spend a few years abroad, in Cambridge, and then returning to India. She expressed her desire to continue her interest in mathematics, without conflicting with her married life. Overall, I carried the impression of a quiet girl, who knew what she wanted and who would not compromise with principles.

This favourable impression that I formed in the morning walk continued to grow during the day as we had lunch at home and then after some rest went out on a longer drive in the countryside. Her uncle regaled us with jokes and anecdotes. He had had a varied life. He was first employed in police force during the British era and had to face a false accusation of a crime he had not committed and of which he was exonerated when the real culprit was found. However, he decided to quit the police service and he trained himself to be a personnel officer. This profession was the right one for him as he got a job in one of the industries in Bombay. Because of his abilities in this field, he had grown from strength to strength and become the Head of the Personnel Division of Forbes, Forbes and Campbell Company, the second (and now the oldest) company from Britain after the East India Company, to start business dealings in the Indian subcontinent.

The next morning I went to see them off on the Delhi-Ahmedabad mail. No decision had been taken: this was assumed to be an introductory meeting and I was to see the Rajwades at lunch in their place in Dadar when I next came to Bombay which was on the 31<sup>st</sup> of the month. However, I was feeling that in my search for the ideal bride, I had hit the jackpot at first attempt. I spent considerable time thinking about my decision and ultimately wrote out a longish (for me!) letter of proposal to Mangala. I planned to give it to her in person on the 31<sup>st</sup>. I should add that I kept this decision to myself; my parents also did not know of the letter or of my decision.

My flight from Jaipur landed in Mumbai in mid-morning of the 31<sup>st</sup>. Mangala, her aunt and uncle were at the Santa Cruz airport to receive me. We went to their Dadar flat, where I was entertained to an excellent meal. I was to catch the Deccan Queen from Victoria Terminus and so would need to leave Dadar at around 4 p.m. Mangala's uncle took my leave to go to the office, saying that he would meet me at VT around 4.30 p.m. or so. He had arranged for me to be taken by car to VT after I had some rest after lunch and a cup of tea.

As we had some quiet time together after lunch, I handed over my proposal letter to Mangala and asked her to read it carefully and then decide upon it in due course. I did not wish to press her for a quick decision. In particular, I was anxious that she should say 'yes' or 'no' of her own volition. [In many traditional families girls have no say and thus are compelled to say 'yes' if the family thinks so.]

I watched her as she read through my literary effort and saw that she was evidently deeply affected by what I had written. In the end, she smiled through her tears and said that the answer was in the affirmative. She mentioned that only because it was so to start with that she had let the proposal go through to my parents. I was very relieved and happy. I really cannot describe my emotions exactly, but would like to say that they came close to what I had felt on winning my Cambridge awards, except that this award was for life!

I requested Mangala to keep this development to herself till I talked to her uncle and aunt who were really in *loco parentis* to her. Also I wanted to inform my parents before the news was made public. She saw the logic of my proposed action especially since both of us had suffered from rumours and miss-information.

At the VT station, Mangala's uncle saw me near the Deccan Queen carriage in which I was to travel. I drew him aside and informed him of my proposal to Mangala and its acceptance by her. He was very pleased and agreed to keep

the news to himself till I lifted the embargo after I had given the news to my parents in Ajmer. On practical side, I also informed him that I would prefer to go back to Cambridge, still a bachelor after my scheduled visit under the CSIR invitation was over. I had to arrange for suitable accommodation for me and Mangala, since my Fellow's apartment was for bachelors only. I was hopeful of getting a flat from King's not too far from the city centre. Mangala's uncle agreed to this arrangement.

As the Deccan Queen rolled off the platform, I sat reviewing my decision. That I had acted as per the dictates of my heart made me feel very relieved in the first place. I, however, still had to work out all its practical implications. I hoped that Vasantmama, who had been so helpful when I first left India for Cambridge as an undergraduate, would advise me on this occasion too.

Vasantmama and Prabhamami were pleased to hear of my decision and did help me take various practical decisions. For example, they advised me to meet and suitably inform my decision to the other girls on my list. They helped in carrying out these steps.

I wrote a letter to my parents informing them of my decision and asking for their blessings. I received a telegram after a couple of days "Congratulations! Very wisely done." Signed by them both. They agreed with my suggestions and we decided on February 6 as the date of my engagement ceremony to be held in Mangala's flat in Dadar.

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I had my first assignment at *MATSCIENCE*, Madras. I flew from Mumbai on January 2 and was met at the Madras airport by the Director Alladi Ramakrishnan. He put me up at the Woodland's Hotel, where some other delegates to a conference he was hosting, were staying. I was happy to deliver my lectures to an audience of less than 50, mostly institute faculty and research scholars and delegates to the conference. It was a change from my previous trip to India, where I had to lecture to audiences in hundreds!

However, the pleasant stay in Madras was rudely shaken by the shocking news of the sudden passing away of Prime Minister Lal Bahadur Shastri at the Tashkent meeting with heads of states of Pakistan and Russia. In his own unobtrusive way, this great man of short physical stature was beginning to establish a firm and steady rule over the post-Nehru India, giving a good answer to those who used to ask : "After Nehru who?" I think most Indians wished to have Shastriji at the helm of the nation for a few more years.

I called on Sir C.P, Ramaswamy Aiyer, at his residence. He was pleased to see me and recalled his old associations with the B.H.U. As its Vice-Chancellor he had frequently consulted my father and had a high regard for him.

Then I did something I never had done before. I went into a major saree shop in Madras and bought two Kanjeevaram sarees, one for my mother and one for Mangala. The latter was an unusual ‘Oxbridge’ combination: the main body of the saree was light (Cambridge) blue while the border was dark (Oxford) blue. I am happy to say that both my selections (carried out within 15 minutes!) were appreciated by the recipients. I am sure the shop assistant who was showing me the sarees was greatly surprised by the quickness of my decision.

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After returning from Madras, I went back to Mumbai and after spending the weekend, moved on to Ahmedabad. During the weekend, Mangala and I saw a lot of each other, as we both wanted to get to know each other well. For me every encounter reinforced my conviction that I had made the right decision in my choice of the bride. I introduced Mangala to my relatives and family friends in Bombay, like Dadamama and Professor Agashe. Morumama knew her from before, having taught her algebra at the M.Sc. level and recalled her as a very bright student.

An embarrassing situation, however, developed during this weekend. The Rajwades had recommended the P.L. Deshpande play ‘*Varyavarachi Varat*’ in a theatre in south Bombay. They also got us tickets for the show. I had mentioned casually to Dadamama the evening before when I had visited him with Mangala that we were planning to see the PL-show the next morning. In the morning, after the first act of the show, there was announcement from the stage that I was attending the show and was in the audience and the organizers wanted to accord a special welcome to me. PL, who made the announcement also said that he would not reveal where I was sitting, otherwise, the audience would continue to look at me rather than view the performance! And, an emissary from him came looking for me to invite me behind the stage. I followed him behind the stage and saw both PL and Sunitabai, who gleefully told me that they had a spy (in the form of Dadamama) who had told them that I was going to attend the show.

I was red under the ears, for if the crowd saw me with Mangala there would be speculations as to who she was and our closely guarded secret engagement would be blown apart. I was also exasperated with Dadamama for

informing PL about my presence, much though I would have liked meeting PL and Sunitabai otherwise. To avoid being mobbed after the show, Mangala and I sneaked out a few minutes before the end and took a taxi to Taj.

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Vikram Sarabhai was hospitable as usual and placed a well equipped guest room in his house at my disposal. I gave a set of lectures on cosmology at PRL. People from the University and some town colleges had also come for attending these. A few people had come from the Tata Institute also. Mukul Kundu, amongst them suggested my visiting TIFR and giving a similar set of lectures there. I agreed to this suggestion readily as this gave me an excuse to be in Bombay for a longer period and thus get to see Mangala more often.

It was during my visit to PRL that we were hit by another terrible news, similar to the shocking news of the death of Shastriji. I had spent the weekend at Ajmer/Jaipur with my parents, half way through my stay at Ahmedabad. When I returned from Jaipur by plane, I heard from Mallika Sarabhai that the Boeing 707 belonging to Air India had crashed in the Alps, in the vicinity of Geneva. No survivors were expected. The tragic aspect for Indian science was that Homi Bhabha had been a passenger on that plane. Vikram, who had been outside Ahmedabad returned that night and was, like most of us, in a state of shock. The accident took place on the 24<sup>th</sup> of January and cast its shadow on the usual Republic Day celebrations two days later. Ironically, in the Republic Day honours, Vikram's name was announced as *Padmavibhushan*.

During my weekend visit to Ajmer, I got to see the Marathi book written by Tai describing my 'epic' tour of India in 1965. Written for private circulation it caught the excitement and spirit of those days very well. At Ahmedabad I got to see Manorama Sarabhai and Anand, as well as Professor P.C. Vaidya, at various meals.

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On my return to Bombay I extended my stay so that I could lecture at TIFR and I enjoyed the experience. These were not diluted lectures to huge audiences, as in 1965, but technical seminars to 20-25 people. I felt that when I did want to come back to India, I should think of TIFR as my first priority.

As engaged couple, Mangala and I were also going through rounds of

lunches and dinners with our close relatives and friends on both sides. The news of my engagement was no longer a ‘secret’ and we were receiving congratulations. We both travelled to Pune to meet our relations and friends there too, while I gave my lectures in the Mathematics Department of Poona University. I gave a public lecture on the origin of elements at the National Chemical Laboratory, which attracted a big audience just like in 1965. I met Mangala’s mother (Kumutai) who worked in a hospital in Pune and also several of her cousins. She herself was staying with the Chitales, the Head of their family being Balasaheb Chitale, elder brother of Kumutai. All his sons teased Mangala whenever I telephoned to talk to her.

Both of us travelled back to Bombay for our engagement ceremony on February 6. The ceremony was simple and was confined to a small group of relations on both sides. The ‘elders’ on both sides then sat down together to decide on the date and modality of the wedding ceremony. I hoped that I would be able to find suitable accommodation for Mangala and me in Cambridge after I went back in early March. Since I should be present in Cambridge through the Easter term, I decided to come back in early June. My parents had been married on June 21, 1937, and I felt that it would be a good idea if I too got married on June 21, 1966. Neither I nor my parents believed in astrological fixing of the wedding date and the Rajwades also did not have a strong view on this issue. So we decided upon June 21 as the ‘D-Day’.

After another stay at Ajmer, I went to Delhi in late February, for a seminar on general relativity which was arranged by the CSIR at the National Physical Laboratory. Professor Mercier had attended from Switzerland and there were relativity groups present with their work from Ahmedabad, Calcutta, Madras, BHU, etc. I felt that the meeting served an important purpose in bringing together workers in one field. This meeting served as a trigger for another meeting in 1969 in Ahmedabad where the Indian Association of General Relativity and Gravitation (IAGRG) was formally created. Likewise the International version of such an organization was started by Professor Mercier in 1966.

After my engagement, I informed several friends abroad of my progress on the marital front. I received congratulations from them, of course. But one letter brought a very tragic news. Yashoda Dilwali wrote that just a few weeks back, she had lost Charat: he had a sudden massive heart attack from which he died instantly. This was a great shock to me and I felt a deep void in my life, losing such a close friend and wellwisher. Yashoda slowly recovered from the shock, planned her own life and continued living it in New York where she

took the job of a dietician . As the Dilwalis had no children, I could imagine the emptiness felt by Yashoda.

I had delayed my departure from Bombay from the 1<sup>st</sup> of March to the 4<sup>th</sup> of March. I had a very satisfying academic time visiting the four centres in Madras, Ahmedabad, Bombay and Pune. But most importantly, on the personal front, I had taken a major step in shaping my life from hereon. I felt that I was leaving part of myself behind when I bade Au-Revoir to Mangala and stepped on the tarmac for my flight.

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Back in Cambridge, the routine of my work and leisure continued as before, but I was now preparing for a change-over from a bachelor's existence to a married one's. I approached the domestic bursar of King's, Mr Bolgar for help with accommodation. He was very forthcoming and informed me that the College owned a set of flats in Croft Gardens on Barton Road, next door to the house of George Salt and within easy walking distance of the College. One flat had just fallen vacant and it needed some interior work to get it into good shape. He offered it to me at a very reasonable rent (much less than what it would be in open market). I went there with the porter Mr Ellis, who had been put in charge of getting the repairs and maintenance done. It was a two-bedroom flat with one bathroom and separate W.C. The kitchen needed a fridge and cooker, which, Mr Ellis suggested that I buy when setting up my establishment. I agreed and he set to work on the flat, promising me that it would be ready by the time I returned in mid-July with my bride. He was true to his word.

In the meantime I was also consulting Mary Wraith and Barbara Hoyle on various domestic requirements and where one could get them. They had a few shops in mind, but suggested that I wait till Mangala arrived and did the choosing herself. I also needed to buy a car and after consulting Ted Knott decided upon the Hillman Imp. I chose the Capri blue colour that I liked. A brand new model of the car was ordered to be delivered on the day I returned to Cambridge with my bride.

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Meanwhile I was in correspondence with Mangala and my parents regarding wedding arrangements. My father was to complete his tenure as Chairman, RPSC at Ajmer and he had opted to take up the offer of Lokamanya Tilak

Chair in Applied Mathematics and Astronomy at Poona University. My parents were planning to move to Pune in early summer. Thus they would be well settled by the wedding day, June 21<sup>st</sup>. Both Mangala and I wanted the wedding to be simple and I recall urging my parents that there should be minimal, if any at all, of exchanges of gifts between the two sides. I argued, I think quite forcefully, that these gift matters often turn out to be very taxing with the person gifted not being happy with the present offered, and the person gifting it feeling very sad because of it. I asked my parents to say that barring the bride and groom, nobody should be gifted. I also said that if anyone objected they were free to say that this was 'by order' from the bridegroom. In the end these suggestions fell on deaf ears on both sides and there was a certain amount of avoidable bickering on both sides.

In the meanwhile, I wanted to play a trick on everybody. I had given out June 1, as my date of arrival. I decided to come a day in advance, leaving Cambridge on May 30 and reaching Mumbai on May 31. I took Mangala in confidence and asked her to meet me at the airport for the flight I had chosen. My arrival would be as much a surprise to the Rajwades as to my parents, now in Pune. I must say, she guarded the secret very well. She borrowed her uncle's chauffeur-driven car saying that she had a wedding to attend in Andheri. She also informed an Air India official who helped me with immigration and customs on my arrival. So we came back to Narayan Mansion, the Rajwade residence and everyone was surprised to see me. I was in time for lunch, although Kaku (Mangala's aunt Mrs Rajwade) was disappointed that she had no prior intimation to enable her to prepare a special meal for the VIP! I told her that I preferred a simple meal and that she should not feel annoyed with Mangala who was carrying out my orders. I then phoned my parents and they too were surprised, happy and also a little peeved at not being taken into confidence. My father, however, drew the philosophical satisfaction which he expressed to me thus: "This shows that your bride will be very loyal to you and will carry out your wishes efficiently".

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I went to Pune the same evening by the Deccan Queen. My parents had started preparing for the wedding and there were the usual 'Kelavans', i.e., meals for the bride and the groom from their respective close friends and relatives. Mangala and I went to some jointly, and some separately. However, there was one aspect of the wedding that began to cause me some concern.

I noticed that my father was getting more and more nervous as the wedding day approached, feeling (quite unnecessarily, as I could see) that he may be suddenly asked to spend money on some item or the other and found with no cash in hand. He started getting irritable and some of it rubbed off on the Rajwades and the Chitales (Balamama and his family). They were very unhappy with his outbursts, for which they saw no reason. I was doing my best to be some kind of a buffer but not with success. This aspect of my father was quite new to me. I had always seen him composed and in control of the situation, whatever it may be. I felt that partly the effect came from his diabetes and partly for his feeling 'all alone' after leaving Rajasthan. In Ajmer, he was 'THE BOSS' with a lot of helpers around. Here he was on his own and this caused him insecurity. As things turned out, he never had any financial problem during or after the wedding; but who was to tell him that his worries were groundless?

Neither my father, nor I believed in rituals and this was the reason why the standard "Yajnopaveet" (the thread-ceremony) had not been performed on me or my brother. Now, however, the priest of Rajwades felt that I need to have that done in order to get married. To keep them happy, and much against my will, I went through a hasty yajnopaveet ritual. There are indeed, a number of rituals in our wedding ceremony proper that seem irrelevant today. At our wedding we did not go into these aspects much, but at our daughters' weddings, at their insistence we paid greater attention to them and found that we could streamline and shorten the ceremony considerably by weeding out a number of rituals.

So, on the 21<sup>st</sup> of June, Mangala and I were married at the Suvarna-Smriti Mangal Karyalaya, which is at a stone's throw from the Chitales' family house in Deccan Gymkhana, close to the Pune Youth Club Cricket Ground. This was of great convenience to the Rajwades who had come over from Mumbai and had made the Gopikashram (the name of the Chitale House) their temporary headquarters. My own relations from Kolhapur and Mumbai and Satara were put up by the Rajwades in another, Shrutmangal, Karyalaya not too far. I had brought my 8-mm movie camera for taking some shots of the ceremony. Those days the invention of video-shooting was unheard of. I was lucky that no less a person than the movie producer and director Ram Gabale, a friend of my father's, had sent his colleagues to help in shooting.

In the evening I returned a married man, to my parent's house in the Pune University campus, the house I had left that morning as a bachelor. Mangala and her family came shortly and we had a simple ceremony of 'Lakshmi

Pujan' and Mangala's official entering of her new house. I also had an opportunity of renaming her on this occasion by writing my proposed name on a plate covered with rice. I preferred to leave 'Mangala' as it was!

Those days India was passing through food shortage and there were severe restrictions on the sizes of banquets on such occasions as weddings. So we had these in a low key. Nevertheless, we had two receptions at which simple snacks were served: one in Pune on the wedding day and the other in Bombay mainly for most of Mangala's uncle's friends and business acquaintances. This was held a few days later, on June 25<sup>th</sup>, after Mangala and I had moved to Bombay.

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Our final departure to Cambridge was on July 9, when we were seen off at the airport by a large number of friends, relations and well-wishers. For me it was a routine by now, since I had come and gone from the shores of India a number of times. But for Mangala, it was the first occasion to be away from her family with no specific date known when she would see them again. Naturally she was torn between excitement of going abroad on her honeymoon and the sadness for leaving behind her near and dear ones.

I had planned beforehand, that after our wedding we would travel to the UK and Cambridge, via Rome, Geneva and Paris, spending around 11-12 days on our honeymoon. I had asked Air India to book hotels for us in these cities. I was hoping (in making these arrangements) that Mangala would have her passport with her new name on it, together with the visas for Italy, Switzerland and France, in time for the journey. With Mr Rajwade's contacts in Bombay, this could be managed and we travelled as planned.

Our flight from Bombay landed in Rome at around 7 in the morning. As we were collecting our bags at the conveyer belt, I was greeted by an Englishman. "That is an important tie you are wearing" he remarked. I was wearing the crested tie of King's College, which he had recognized. "Your tie is important too", I replied recognizing the tie of Hawke's Club, the exclusive club for Cambridge sportsmen which I had seen Raj wear. I later explained to Mangala the background to our exchange.

The weather was beautiful in Rome and we could do our sightseeing comfortably. One of the new Fellows of King's, a young economist Mario Nuti was going to be in Rome at the time and had left his contact phone number with me. I contacted him and he joined us, taking us to an ice cream parlour where we were treated to ice creams of many flavours. Those days Indian

women abroad were a ‘novelty’ because of their dress. I realized this when we were visiting the Vatican. At the art gallery, one Italian saw Mangala in a saree and being intigued by her dress, he went round her twice to see how the saree was wrapped round the body!

From Geneva, we could plan a day trip to Mt Blanc in France and this was very enjoyable. Mangala saw snow for the first time and enjoyed making snow-balls and hurling them at me. In Paris, I celebrated my first birthday as a married man...we had a dinner in a good restaurant with my favourite dish of coq-au-vin. This being my third visit to Paris, I had no problem in showing Mangala round the important attractions. There I discovered how fond she is of paintings and arts in general. She particularly liked the Louvre and the impressionists’ gallery then housed in the Jardin des Tuileries.

So all in all we had an enjoyable 12 days and when we landed at the London Airport, the weather cooperated by being dry and sunny. We took the bus to central London and train to Cambridge. I was conscious, that when I became a college fellow, I had experienced a major change in my living style. From a bachelor to a married man, I was now to experience another major change in my life.

## HOUSEHOLDERS IN CAMBRIDGE

MANGALA and I arrived in Cambridge, at King's on the 20<sup>th</sup> afternoon at 3 p.m. and after my arrival, the first thing I did was to talk to Mr Ellis, the porter who was looking after the College flats. He came and greeted us at A4 with the good news that the flat at 4 Croft Gardens, was painted, furnished and ready for occupation. After congratulating me for my wedded state, he gave me the keys and told me that if he could help in any way I was welcome to call him.

My next task was to ring up Ted Knott at Herbert Robinson's garage and ask for the delivery of the car I had ordered. Mr Knott came with the car to King's within a quarter of an hour. I paid for the car (around £ 600) and took possession of it. The insurance had already been arranged and so I could drive it right away. Mangala and I loaded the car with our bags and started to drive out of King's, when the Head Porter signalled to me to stop. He placed a special badge with the letter 'K' on it, which entitled me to park the car on the cobbles and other parking areas of the College. This was a great convenience, particularly to Mangala as it turned out, since King's is located very close to the town centre where all the major shopping areas are located.

We drove down to Croft Gardens and I checked that the key fitted Flat number 4 which was on the first floor of a two-storey building. There were three buildings, all looking very 'un-English', painted in white on the outside and situated in a garden-like setting. As we were to get in, I asked Mangala to stop. I lifted her and took her inside across the threshold, a western custom of

bringing in the bride into her house. It was 3.45 p.m. I am surprised even today that everything worked out without a hitch that day.

Mr Ellis had done a good job and we had a flat equipped with gas cooker, a water heater and good furniture and a telephone. We still needed several household items which we decided, we would buy in due course.

I telephoned Jamal and Suraiya and as always they very hospitably insisted that we dined with them that evening. We gladly took up the offer and were welcomed to a sumptuous meal. We also found out a launderette where we could get our clothes washed and dried until we acquired our own washing machine. We also needed a refrigerator, of course.

But as Mangala discovered, shopping was no big hassle. There were no shortages for any item, no queuing or form filling, no need for getting special dispensation from some important official to get items of daily need like telephone, gas, etc. We soon became 'self-sufficient' and found that we could return the hospitality of all our friends who invited us to meals, to welcome the new bride. So we had the Salts, the Islams, Barbara Hoyle, Mary Wraith, the Lapwoods and some King's Fellows with their wives visiting us for meals or tea at 4 Croft Gardens. Anant had by now been well settled in his new abode at the University of Lancaster where he was appointed a Lecturer in physics. His supervisor David Dew Hughes had also gone there in a more senior position.

Mangala soon discovered that her cooking experience in Mumbai had been very limited, largely because her Kaku had been doing all the cooking. Although Mangala had been trained by her, the items she knew how to cook were limited to bare necessities. So she quickly decided to learn new things getting instructions from Suraiya, Joyce Salt, Mrs Campbell (our neighbour from No.1, Croft Gardens), Barbara, Lady Jeffreys, etc. What I admired about her was that she quickly adapted herself to the changed style of living and was completely at home in Cambridge.

We were soon joined by Chandra and his newly acquired bride Priya. Chandra had met her in Sri Lanka on his last visit and he had married her. None of us had thought that a firm bachelor like Chandra would 'lose his wicket' before I did. But the four of us got along very well together. As luck would have it, Chandra also bought a Hillman Imp similar to mine and with the same colour! Chandra and Priya were regular visitors at our house, where we played our brand of bridge.

An amusing incident took place in connection with these bridge meets. After the game was over, Chandra and Priya would leave Croft Gardens in their car. Chandra had a way of starting the car that made terrible noise. Our

neighbour at 21 Barton Road, George Salt used to be an early to bed person and he was woken up by this noise. Once he mentioned his exasperation to me saying that someone, who ought to know better, seemed to make a lot of noise starting his car. He, of course, did not know that it was Chandra visiting us. I communicated this to Chandra and from then onwards, he started his car more softly.

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In the second week of August, we decided to test our new car by taking it all the way to Scotland. We had invitations from Anant to Lancaster, Kumar and Suvarna Chitre to Leeds and by Sadhana and Arun Mahajani to Mauchlin in Ayrshire, Scotland. Arun was then at the Ballochmyle Hospital. This was also an occasion for Mangala to see something of the North of Britain.

The Imp performed very well and we enjoyed the countryside in a weather that was not very hostile. Indeed we did have more than the expected share of sunny days. Anant seemed well settled in Lancaster, although he still preferred to remain a bachelor. We hosted a dinner for our wedding at Lancaster at which the Mahajanis also joined with Anant. The Mahajanis were due to return to India where Arun (who had his FRCS now from two places, London and Glasgow) and Sadhana were to join a hospital run by the Birlas at Nagda in Rajasthan. The Chitres joined us the next afternoon and we did a tour of Yorkshire dales with them, before setting off for Scotland.

At the Ballochmyle Hospital, we also met another Indian couple, Durga Dutt and Yashodhara Gaur from Rajasthan. They were great friends of Arun and Sadhana and we soon found them very informal and likeable. They have remained good friends of ours since then. In the evolution of a family, they were one step ahead of us: they had a baby daughter Seema with them.

On the way back from Scotland, we came without a night-halt, dropping the Chitres in Leeds on the way. The car performed well on the 365-mile stretch with myself only driving all the way. Mangala had forgotten her Indian driver's license in Bombay and was keen to resume driving in Britain. Her uncle had sent it on to Cambridge. We decided to wait for her licence to arrive, so that she could take a few lessons to get accustomed to the more disciplined driving in England and then to try for a British license. She got hers in the second attempt and could boast that she did better than I could with success only in my fourth attempt!

We had sent three trunks of household effects from Bombay prior to our

departure, by boat. These items duly arrived around eight weeks after we landed in Cambridge. The foodstuff was very welcome as were the sheets, books and other wedding gifts we had received in June.

Mangala and I saw Morgan Forster on several occasions and he was always very pleased to talk to her. He had two good friends, Bob and May Buckingham who often visited Cambridge to see him and at whose home in Coventry, Morgan was a frequent guest. The trio liked to visit the Aldbergh music festival every year as Morgan was quite a connoisseur of western classical music. Once we decided to visit them for lunch during the festival. So we drove to Aldbergh, but on the way, a curious accident hit us. As I was driving, a pebble hit the windshield and it shattered to small jigsaw-like bits. This experience was quite new to us since I had seen glass crack into large pieces. We contacted an AA-man who explained that the recently designed windshields cracked in the jig-saw fashion as a safe mode. He removed a lot of the pieces from the shield and advised us to drive to the nearest Hillman garage whose address he gave us. Fortunately it was not raining and we took the car there and asked the garage mechanic to replace the windshield. This would take two to three hours, we were told. So we called Bob and requested him to advise us as to how we could get to Aldbergh in time for his lunch. He very kindly drove round to pick us up. After the lunch and a chat with Morgan and the Buckinghams, we took a tour of the festival city and then Bob drove us back to the garage. Our car was ready for collection and so we could drive back to Cambridge not too late.

Amidst all these friends I knew earlier and was introducing to Mangala, she was very pleased to discover that there was one from her side whom she could introduce to me! This was Prakash Apte, a cousin once removed who was now in London to do a course and articleship for becoming a Chartered Accountant. Prakash used to visit us from London on some weekends or on public holidays. I used to joke that he was a willing guinea pig for Mangala's cooking recipes. For, his visit would inspire her into trying some new recipe, Indian or western. Prakash was too polite to comment adversely if a dish did not turn out as planned (which I must admit, happened seldom).

When the Michaelmas term started, Mangala started attending some courses in pure maths so as to keep her interest in the subject alive. Amongst those who lectured and also attended other lectures was a professor from Cornell University, John Eels. He was impressed by Mangala's career and suggested that she gave a course of lectures on several complex variables, an area in which there was nobody in Cambridge available to teach. After some hesitation she agreed and gave an excellent course of lectures. Later Eels wanted to propose

her name for a teaching fellowship at Churchill College, which he was visiting. But as that would have tied her to Cambridge during terms, she declined the suggestion.

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I had been following the progress of the Institute all this time. Our arrival on July 20 had coincided with a major setback to the Sterling currency in the financial market. Many experts were predicting devaluation of the pound from its then value of \$2.8, but the labour government refused to take this step, which in those days of fixed exchange rates, was considered a blow to national pride—a step to be taken only in the last resort. But to prevent further disaster, the government imposed stringent financial restrictions to prevent outflow of hard currency from Britain. These considerations mattered in domestic budgeting also and the expected governmental approval to the institute was being delayed. However, since the funds for the building of the institute were coming from a private source, the Wolfson Foundation, Fred Hoyle went ahead with the building plan.

While on his visits to the University of California at San Diego, Fred had frequented the building the Burbidges worked in, the Institute of Geophysics and Planetary Physics (IGPP). It was an open plan building with redwood walls and large glass facing the seaward side. It was a simple long rectangular building with offices on the two sides of the central corridor. Fred wanted a similar building for his IOTA (Institute of Theoretical Astronomy), with the difference that the redwood would be replaced by bricks. Tree-felling on the plot of land went on in preparation of the building, and Fred was sorry for sacrificing marvellous trees to make way for brick and glass. Many years later he confided in me as I was planning to set up IUCAA: “Do try to retain all the trees that you can. They are a valuable asset ecologically.” Based on this advice we went in for a large programme of transplantation of huge banyan trees that were threatened by our building plans.

Fred was also trying to recruit staff members for the Institute. Thus, apart from me, Chandra, Sverre, John Faulkner and Peter Strittmatter were informally offered a position by him. He had been less successful to attract people than he had hoped, because the future of IOTA itself was not guaranteed beyond six years. Thus Roger Tayler, whom Fred had initially invited to work with him preferred to remain in the DAMTP and later moved to the Astronomy Centre in Sussex, where he was offered a permanent academic position. Fred

was, however, successful in attracting a large number of regular visitors and once the IOTA got going, it was a hub of academic activity with a large number of visitors from the USA and Europe passing through.

However, the actual appointments had to wait for a while, because of the pending government approval. Gradually, most of us on the above list got their appointment letters, but mine was still not in the offing. Fred explained that he had asked for a higher salary for me and that had to go through a bureaucratic delay but he was confident that it would come through. It did, and in a somewhat comic manner it shows the British diplomacy at its best. I was contacted on phone by the Registry (the equivalent of a University Registrar), who said that he was going to sound me out with a routine offer. If I refused it, he would call again and make an alternative higher offer. And he proceeded to make a routine offer: would I accept a staff member's position at the IOTA if offered the starting salary to begin with? It went against my heart to say 'No' to an offer to work in an institute for whose creation I had been waiting so anxiously. As I hesitated, the official prompted me again: "If your hesitation indicates that you are not happy with the offer, you should say so." So I did blurt out with the required 'No'. Then the Registry said: "Dr Narlikar, I have you on record as refusing the offer I just made." He then hung up and called again. As I waited with baited breath he continued: "I noted your refusal of the offer I just made and am now authorized to raise the offer to a higher figure." He then made his second offer which I accepted!

On the College front also changes had taken place. Noel Annan, the Provost, had been elevated to a peerage and he had been known as an active socialist worker. He saw a greater future for himself (especially during the tenure of Harold Wilson's labour government) in London and accepted the headship of the University College, London. I recalled, he was quizzed by the pressmen as to whether he regarded this step as upwards or downwards and with his political acumen he replied that for him it was a step sideways. I wonder if this reply pleased either of the two distinguished institutions involved.

Nevertheless, this had led to King's requiring to look for another Provost and there were the three caucuses in action. The caucuses were groups of fellows satisfying a certain criterion. Thus the 'junior caucus' was composed of junior fellows, the 'senior caucus' made of senior fellows while the 'middle caucus' was for those in between. These caucuses met (-the middle caucus rarely met-) whenever there was an issue requiring votes by fellows, to discuss the possibility of a consensus. So for the election of a new provost, the caucuses met several times. It was somewhat like in C.P. Snow's novel *The Masters*.

Eventually, Edmund Leach was elected by the Fellows in an election conducted in the chapel. On October 3, 1966, Leach was sworn in as the new Provost and the event was followed by a feast for fellows only.

Coming back to IOTA, Fred's friend Frank Westwater was appointed Secretary of IOTA, an administrative position equivalent to the chief administrative officer. Fred being the Director, took the major decisions assisted by a Committee of Management, while the day to day running of the institute would be the responsibility of Frank. This arrangement suited Fred as he was not the best of administrators and Frank was very loyal to him. In fact, with his industrial connections, Frank had been responsible in helping Fred contact the private foundations that finally came out in support of IOTA.

One important component of the Institute was the IBM computer which Fred had ordered. It was installed in a small extension next to the Institute building. It was an excellent machine for its time and was very useful for the stellar evolution programmes that Fred and John were interested in. However, soon it was in great demand from outside users also, especially the molecular biologists. Thus Fred's wisdom of installing a state of the art computer was fully vindicated.

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My research work, which had slowed down because of the transition from bachelorhood to the married status, picked up again after a few months. In the month of December, I wrote up an essay on my work on action at a distance starting with electrodynamics and ending with gravitation. I submitted this essay, entitled "Gravitation, Mach's Principle and Cosmology" to the University of Cambridge for the Adams Prize. The topic for this prestigious award was announced every year and the essay on the topic could be submitted by any degree holder of the University, anywhere in the world. The topic for 1966-67 was close to that of my interest and after consulting Fred Hoyle, I had decided to try for it.

One evening in early May, 1967, while Mangala and I were thinking of turning in after dinner (it must have been after ten o'clock) we had a phone call. Stephen Hawking was on the line. He informed us that the result of the Adams Prize was announced and posted on the notice board of the Senate House that day. Roger Penrose had been given the Adams Prize but Stephen and I were also given additional Adams Prizes. This was great news and we

decided to drive over to the Senate House and see for ourselves. Yes, there the notice was, in black and white!

This prize completed the trilogy of prizes that I could aspire for as a mathematics student at Cambridge: the Tyson Medal for astronomy in 1960, the Smith's prize in 1962 and now the Adams prize in 1967. I sent this information by cable from the main post office and the same gentleman was at the counter who had earlier congratulated me on my previous awards and examination successes!

This work brought to a conclusion the programme of describing the classical 'field' theories in terms of action at a distance, that is, *without* the intermediary fields. This is not the right place to engage in a discussion of the rival merits of fields versus action at a distance. Suffice it to say that, the action at a distance approach had one merit in our (that is, Fred's and mine) eyes namely that it brought together in a nice way the very large scale structure of the universe and the very small scale of subatomic particles. The pathbreaking work of Wheeler and Feynman had shown us the way to achieve this synthesis.

However, this had led us to our next challenge. In describing the behaviour of subatomic particles, one needs to use the rules of quantum theory, rather than the rules of motion laid down by Isaac Newton. So we needed to adapt our recent work to quantum theory. This was known to be a hard nut to crack and at Caltech, back in 1964, Richard Feynman had warned me that this may turn out to be insurmountable. In fact, because he found it so that Feynman turned to the field theory option and showed how to make it compatible with quantum theory. John Wheeler had also adopted field theory because of the same reason. Indeed, Wheeler used to describe this change of attitude, as that of an alcoholic who gets converted to being a teetotaller...the convert becomes even more strongly attached to his new belief than a normal person. Thus Fred and I had embarked on a path that Wheeler and Feynman had abandoned as being too difficult.

At this time, I felt that the summer vacation of 1967 could be best used by me if we went to the United States on a three month visit to the University of Maryland. Howie Lester, whom I had first met in 1964 when he had visited the DAMTP had invited me to the department of physics and astronomy, of which he was the Chairman. The months July to September seemed the best for this purpose. The university vacations would have started then and as a university employee now, I had to abide by the leave rules. Also, the Institute building had still not come to completion and thus its full academic programme would not start till October 1967.

This visit had a negative side too! Fred had invited a number of visitors from the United States, including the Burbidges and Willy Fowler, Robert Wagoner, Donald Clayton, etc. Although there was no real space available for all these visitors to congregate, I would be missing their company while I made the reverse transition from the UK to the USA.

Barbara, as hostess to all these visitors was at her best in arranging entertainment through dinners, parties, afternoon teas, etc. She also helped those who needed short term accommodation. In particular, the Wagoners, Bob and Lynn, with their baby daughter Alexa, were looking for a one or two-bedroom flat for two months or so. Barbara suggested to us that we let them use our flat while we were away in the USA. Mangala and I agreed, although this meant shifting some of our luggage to my college room in King's. And at King's I had been obliged to vacate my more spacious sitting room in A4 for a more modest sized A5 next to it. The reason was quite understandable. Being a married fellow, I did not need as much space in College since I was living outside. Moreover, as explained earlier Morgan Forster needed a young bachelor to stay in A4, just in case of emergency.

In the month of May, I was rash enough to take on a bet with Priya Wickramasinghe, which I was to lose. The circumstances were linked with our New Zealand friend Brent Wilson. Brent used to make very strong statements critical of married life, stating that he was a confirmed bachelor. One day he turned up with a girl from New Zealand called Anna, whose family was close to Brent's. He had therefore been entrusted with the job of showing Anna round UK. "I think Brent will marry Anna", said Priya. Knowing Brent's views on marriage, I said that this outcome was unlikely. However, Priya was sure that she would turn out to be right and challenged me to a bet. I was equally sure that I would be right and took the challenge. The rule we agreed to was that if within a stipulated time frame, they got engaged, I would cook a full meal for Priya, Chandra, Mangala and myself. If they did not get engaged, then Priya would take all of us to the local French restaurant, Le Jardin.

As time passed and nothing happened, I became sure of my win. But, alas, one day, Priya rang up claiming victory. Brent and Anna had just visited them with the news that they were engaged. So she asked me to name a date when I would cook and serve the meal for the four of us. I had no alternative but to concede victory. I named a date, which allowed me to practice some Indian cooking as I had not progressed beyond making an omelette. Mangala gave me some lessons and on the D-Day I could dish out a reasonable meal

which included amongst vegetables, a '*potato surprise*' in which potatos were stuffed with spiced green peas.

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It was indeed a very memorable trip to the USA, which Mangala and I cherish for various reasons. We were accompanied by Chandra and Priya, so that we had good company almost throughout our stay. Chandra had been invited by the University of Maryland too, by Garth Westerhout from the astronomy wing of the department. They followed us at Maryland after a couple of weeks.

In 1967 there was the World Fair in Montreal, Canada, similar to the one I had attended in 1958 in Brussels. As I had very pleasant memories of that occasion, I decided that we route ourselves to Maryland via Canada. That way we would see the World Fair and then the Niagara Falls too. So we flew to Montreal where we had wisely booked a hotel well in advance. For, with the crowds for the fair everything was getting booked up. But we could not avoid crowds at the Fair itself. July being a month of school holidays in North America, we had long queues at all stalls. There were queues at eating places too, which meant that a lot of the available time was spent standing in queues. So, although Mangala found many of the stalls and pavilions attractive and interesting, I kept comparing with the Brussels fair, always to the disadvantage of the Montreal one.

We flew from Montreal to Buffalo, via Toronto. The US immigration office had an agent in Toronto, where he stamped our passports. I had an H-1 (work) visa with single entry while Mangala had a visitor visa with multiple entry. We were soon to learn of the difference!

I had reserved a self-drive car to be available for two days at the Buffalo airport. It was supposedly a compact car, but compared to our Hillman Imp (or for that matter any standard British car), it was huge. But it was automatic and I soon got the knack of handling it. We had room for us in a good downtown hotel, where we drove to in the car. In the evening we drove to the Niagara Falls on the USA side and parked in the car park. We saw the falls and then decided to walk across the bridge to the Canadian side. A lady guard was sitting at the turnstile that allowed people to go through. She paid us no attention, as there evidently was a great deal of informality about this border crossing. We returned the same way after an hour or so and drove back to Buffalo.

The next morning we took the car again to the Falls area and spent time

in sightseeing first on the US side, then taking the car across to the Canadian side. It was fun watching the falls from above as well as from a boat below. After our sightseeing we went along the road by the river bank on the Canadian side, driving some twenty miles, when we came across a bridge at Lewiston, to the US side. We drove across it and came to an immigration barrier. The US official there asked to see our passports. When he looked at mine he said that I could not go into the USA since my ‘single entry’ was already over. I had entered at Buffalo and left at the Niagara Falls. So I could not go in again. He could let Mangala in as she had a multiple entry visa.

I was in real soup! I explained to the official that I was to visit the University of Maryland and that the visa was for working there; that this short excursion into Canada was for sight-seeing, and that I had to return the rented car in the USA the next day. He explained that to cover such cases there was provision of getting a temporary permit to cross over to Canada, which could be obtained from the immigration official at the border crossing. I pointed out that as I drove from the US side I never encountered an exit barrier for leaving the country and thus had no occasion to get such a permit. For a few moments, which felt like ages, he was thinking. Then he smiled and gave me the passport unstamped and told me to go across into the USA. He said that he could not stamp the passport as I had only one permitted entry, which was over. He had chosen the simplest option of letting me through ‘illegally’! It was with great relief that we walked back to the car and drove into Buffalo. We would have been in real trouble if the immigration official had insisted on following the rules in not letting me in.

As we went to bed that evening after a good dinner, we heard sounds of gunshots. The next morning, we enquired at the hotel and were told that there had been a shooting incident in the nearby downtown area. This was our confrontation with the violent side of life in the United States.

The next morning we drove to the airport and after surrendering the car, took the flight to Washington National. I was pleased to see Rajan Devadas with all his kids come to meet us. We drove in his large estate car for a leisurely lunch before he brought us to Howie Laster’s office in the University of Maryland. The whole operation went at a leisurely pace and it was nearly closing time when we reached the Faculty Club, the Rossborough Inn where we were booked for the night. It was not a very exciting place to stay and certainly paled to insignificance before the Athenaeum of Caltech. But for one night’s halt it was OK.

The next morning we called at the department office for information on

rented cars. We had been looking for Volkswagen (VW) beetle, as it was a really compact car. We found a renter in Virginia, just across the Potomac. So I called them and booked a car for a week. The renter sent a man to pick us up and we were able to drive off on our own by mid-day. A friend of Chandra's, Krishna Swamy had lent us the keys of his flat for a couple of weeks till he came back (after getting married) from India. We found it and moved our luggage there. The flat was not air-conditioned and it was quite hot and humid in July. But we were glad to have a roof above our head. Later Rajan helped us find another apartment for a longer duration in Silver Spring. Their occupants, Mr and Mrs Nayak were renting it till they returned from India. Later when Chandra and Priya arrived, they rented an empty apartment in the same complex. This turned out to be double boon. For, we could be together in most of our outings, and later (after the return of the Nayaks), we could move into their apartment.

I was very sorry to receive the bad news in my father's letter informing us that Kaka, my uncle in Kolhapur had passed away. He was in his late seventies, being several years older than my father. He had been keeping indifferent health for the preceding year or so and did not believe in getting expert medical attention. I recalled my meetings with him in Kolhapur, when he in his simple unsophisticated way showed his appreciation of my achievements. I also remembered his innovation, when he had visited us in Banaras at Diwali time, of covering a Diwali banger with a small tin can, which flew high up in the air when the banger went off.

Rajan Devadas helped us settle down in many ways. He found a reliable dealer of used VWs, one Mr Elmer Wells who sold us two VWs at very modest price and promised to buy them back from us at the same price if we could not sell them ourselves. So far as the car we got, it gave us very little trouble, except at the end of our stay, when its gear cable broke. This happened at a very awkward time, because we had already sold the car and were holding it till the new owner collected it. But Elmer got it repaired in time for its collection by our buyer.

At the department I gave some seminar talks, had a general interaction with the relativists there, such as Charlie Misner, Dieter Brill and Asher Peres who was visiting from Israel and Joe Weber who showed me his pioneering experiment for detecting gravitational radiation. Also I spent most of my time thinking over the difficult problem of a quantum version of action at a distance.

Being just by ourselves with no family to look after, both of us couples did a lot of moving around from shopping malls to picnics in parks, sightseeing

around Washington DC, taking long trips to interesting places like the Skyline Drive, Colonial Williamsburg, etc. There are beautiful photographs taken by Rajan Devadas of Mangala on a windy day (which won a prize in a contest), of Mangala and me in the lotus garden off Kenilworth Avenue, of us with his kids, all reminding us of the happy time we had spent in this trip.

While in Maryland, I had been in touch with John Wheeler, with whom I wanted to discuss my work on the extension of the original Wheeler-Feynman approach. He invited me to visit his house in Princeton, suggesting that Mangala and I take the train from Washington DC to New York and get down at Trenton station, where he would come to pick us up. This arrangement worked out fine and we had a pleasant weekend in Princeton. While I chatted with John, Mangala was taken out to look round Princeton and do some shopping, by Mrs Wheeler. At dinner she got us to sign the serviettes, which she would embroider later. I was impressed to see that the serviettes already carried signatures of some very distinguished scientists!

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After this visit was over, we were to visit Yashoda Dilwali in New York. Mangala had not met her before, but for me this visit brought very sad moments. Charat had died unexpectedly and was not there to welcome us. Being without any offspring, Charat and Yashoda lived for each other and now Yashoda was left alone. She was very pleased to see us and welcomed us in a very affectionate way. But I could see that she was still under a state of shock not knowing how to plan her life as a single person in a foreign land. She opted to stay in the same place rather than return to her family household in Delhi. In later trips when we met her, she had recovered and was leading a satisfying life working as a dietician in a nearby hospital. In fact she lived a long life, passing away in 2012.

Mangala got on very well with her and since then they remained great friends. Our coming had brought Yashoda out of her shell and she showed some of her old enthusiasm in taking us round New York showing us the important sights. She came to see us off on the boat SS France, the longest passenger steamer in the world. I had arranged for us to travel back to England in a boat rather than on a plane. I wanted Mangala to experience something of the relaxed life on a big liner. For myself, I wanted to recapture the thrill I had felt on the SS Strathnaver.

After an initial twenty four hours of sea-sickness, Mangala began to enjoy

the trip. I of course had no problem and could enjoy the various pleasures of reading, games and food all through. The food on a French steamer was superior to that on the Strathnaver, but the journey was too short, of 5 days compared to the 18 days of my first voyage. Also, instead of the varying landscape seen from the Strathnaver, here we had the monotonous of the ocean! I had rented a car and when we landed at Southampton, I found it waiting for us. We drove in it with all our bags back to Cambridge where I surrendered the vehicle.

Barbara had got our flat cleaned up professionally, but we needed to get all our packed stuff in my office room A5 at King's back in its place. This took a couple of days. The jet lag was not as severe as if we had really gone by a jet plane. Having travelled by a boat, we had gradually transformed our time zone from New York to UK. But the real shock we had was when we stood on our bathroom scales. We had put on several pounds of weight, because of over-eating in the USA, for indulging in junk food and ice-creams of various flavours. Mangala brought out her diet book which gave a prescription for reducing our weights through cutting down on food calories. We followed it rigorously till, after several weeks, our weights came down to their previous (pre-US) levels. However, as we relaxed the self-imposed restrictions, we felt like retaining one measure for ever: that of drinking tea without sugar. As we drank quite a lot of tea, this step has helped us curtail sugar intake. By the time we got to the end of our dietary regime, we had begun to like and appreciate tea without sugar.

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When I paid a visit to the institute premises I found to my pleasant surprise that the IOTA building was ready and furnished with all the construction rubble out of the way. Fred had very thoughtfully kept one office reserved for me, since he feared that with the staff members and visitors on the site, all offices would be taken up by the time I returned. There was one choice for me to make: each staff member was entitled to an armchair or a filing cabinet. There was of course generous shelf space in each office. I opted for the former since I liked contemplating and scribbling calculations on the proverbial back of the envelope or writing on a paper pad while seated on an armchair. I had picked up this habit from Fred.

The building was due to be inaugurated on November 7 by Sir Isaac Wolfson, the President of the Wolfson Foundation which had generously provided the building funds. Fred, however, felt that starting with the full

term in early October, academic activities like seminars and lectures should begin. I was billed to be one of the first to give a lecture course on action at a distance, cosmology and classical field theory which included the electromagnetic theory and general relativity.

The Vice Chancellor and some other dignitaries of the University belonging to the General Board attended the inauguration on November 7. As it happened, the previous day I had delivered my lecture in the main lecture room where the ceremony was to take place. As the lecture room was being prepared for the ceremony, someone asked if the black board should be wiped clean. Fred took a look at the board, saw the formulae I had written in the course of my lecture, and said ‘No, keep it as it is. They will see that we had already started working before the inauguration.’

Indeed the Vice-Chancellor made a reference to the black board and said in his speech from the Chair: “Sir Isaac, as you can see on the board, the astronomers did not wait for you to open the institute. In their enthusiasm, they have already started working. So it is my duty to declare the Institute ‘closed’ for a few minutes until you open it formally!”

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During the Christmas break Mangala and I had planned to visit India. One of my early (pre-marriage) promises to her had been that we would travel to India once a year. Although this did not happen, we did travel to India three times in the six years that we spent abroad at Cambridge.

We took the various ‘shots’ which were considered necessary those days for travellers to the Indian subcontinent and a few more to ‘protect ourselves’. This was the one aspect of our visit home that I did not like: otherwise it was always a matter of great excitement and anticipation going home. For Mangala, it was of special significance as she was reuniting with her family for the first time after nearly a year and a half abroad. Since both her people in Bombay and mine in Poona wanted both of us to spend as much time with them as possible, there was hard bargaining as we allotted days to the two cities.

Unlike my previous trips to India, when I had committed to visit several academic establishments, this was largely a personal visit. Still, Vasantmama had already arranged through the University of Poona to invite me to deliver the first Lokamanya Tilak Memorial Lecture at the university. This I duly delivered and received the honorarium for it. Both Mangala and I had wanted to buy a fridge for Tai which would help her greatly in storing food and serving

some special dishes which required refrigeration. We had brought sterling currency with us, but were not required to convert it as the honorarium I received just managed to pay for the fridge. It was a small Alwyn model, but it was just sufficient for a family of two elderly people. Tai was greatly thrilled by this purchase.

To celebrate our arrival my parents arranged a big lunch at their residence for Mangala's relations like the Rajwades in Bombay and Chitales in Poona. It was very well attended and appreciated, except for one aspect! Mangala and I were, as the 'main attraction' asked by my parents to be around when the food was being served to ensure that everyone had enough to eat. We accordingly kept visiting the lunch tables and asking the diners to have more. Where we made a mistake was in adopting the 'British' standard for serving. In the UK, one asks whether the guest would have more. If the guest says "No", one says "Are you sure?" to which the guest may again say "No". It is assumed that the guest means it and it is not good form to press him further. What we did not realize was that in India, this is not enough: a guest expects to be pressed further and yet again, before he or she agrees to have more. Many of our guests found that we did not go far enough in pressing them and when they said "No" to our "Are you sure?" we moved on. So they remained hungry!

One of the highlights of our Poona visit was a "hurda party" arranged by the industrialist Vasantrao Vaidya and his wife Jayashree Vaidya. The latter I had met in London in connection with the naming ceremony ('Barase') of Madan, the son of Sharad and Leela Hardikar. (Jayashree Vaidya was the elder sister of Leelatai). This party was arranged in a farm house in the countryside some sixty miles from Pune. It was a very enjoyable experience as we got to taste the rustic food in all its varieties with different types of chutneys.

In Bombay we met the new addition to the Rajwade family: Anil had been married to Suhasini Veerkar from Poona. We would very much have liked to be present at the wedding and were a little unhappy at having to miss it. Normally December/January is a good period for weddings in Maharashtra and we expected this one to be scheduled during our visit. However, this was my first confrontation with the perennial problem in India: belief in astrology. Some astrologer told Anil's mother that as "Simhastha" was beginning in December, no wedding conducted during the year from that date would be auspicious! I have still not learnt why this should be so but then such beliefs are never rational.

But it was nice to see that the new bride Suhas had adapted herself well in the Rajwade family and we were soon to be informed that an offspring was on

the way. This placed some pressure on Mangala (and to a lesser extent on me!) that we should follow suit. However, we had our own agenda and would not be swayed by any arguments.

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The trip back to Cambridge was uneventful and we soon got into our routine. Mnagala was pleasantly surprised to receive an honorarium of £ 160 for the sixteen lectures she had given in the DPMMS (Department of Pure Mathematics and Mathematical Statistics). But we were in for a jolt when I called on the new Domestic Bursar to request renewal of the lease for 4 Croft Gardens for another two years after the first two years were over in July, 1968. He declined, citing the College policy of not extending lease beyond the first two years. I cited the cases of other tenants at Croft Gardens who had been there for indefinite periods. To this he replied that the College was phasing them out and trying to convert the premises for married research scholars. He also advised me that with the way property values had increased over the past years, it would be in my interest to buy a house and sell it when I wished to go elsewhere after a few years.

This was a very sound advice, as I was to discover later. At that time the thought of buying a house seemed a major step to take. Of course we did not have savings that ran to £ 5,000-£ 6,000, which a house of modest size would cost us. Jamal and Sverre had taken this step and they advised me that one puts down a very modest sum and make up the total by mortgaging the house to a building society who pays for the house. In the stories I had read or Indian movies I had seen, the typical plot had a rich family getting into bad ways having to mortgage their palatial house. So a mortgage seemed a serious burden to carry. But my young economist friends at King's High Table explained the way the system operates and stressed the fact that as the value of any currency goes down with time because of inflation, the wise man takes loans and mortgages rather than have big bank savings.

Any reservations I had in this respect were gone when I discussed the matter with Mangala and she too expressed her view clearly in favour of buying a house rather than renting one. So we decided to take this major step and started looking for a suitable 3 bedroom house not too far from the town centre and IOTA.

## HOUSE AND FAMILY

WITH the decision taken to buy a house, we got into the necessary action. We found out that after deciding to buy a particular house, one needed to have a building society to provide the mortgage needed. To decide on the mortgage value of the house the society would have it valued by a recognized valuer. The society would advance 80% of the cost of the valuer's figure or the actual cost of the house, whichever was less. The house would then be mortgaged to the building society. In the case of university employees like me, we could approach the University for a secondary mortgage, up to the balance 20%. The University had its own valuer. To avoid having to pay two valuer's fees, we were advised to approach the Cambridge Building Society for loan, as that society accepted the valuation of the University valuer.

We thus started by looking through the ads with various estate agents for new as well as old houses. We were told not to go in for a house that was more than 4-5 years old, since older houses sometimes involved considerable repairs. Going through the ads of reputed estate agents like Douglas January or Grey, Swann and Cook, and visiting several houses, we finally homed in on to 21 Tavistock Road. It was situated in a housing estate, the McManus Estate, which was off Histon Road in the North-West part of Cambridge. It was within 4-5 minutes drive from IOTA as well as King's. If required, one could walk those distances also. There was a garden in the front and back, the house being a detached one. There were three bedrooms and 'one and a half' bathrooms. The garage had some storage capacity also.

The house was four years old and had one occupant before, i.e., the

existing one. The locality looked fine, consisting of middle class young families with a few old age pensioners too. The house chosen by us was one of the larger type in the area. There was a primary school in the estate and some shops selling daily necessities were at ten minutes walk. The house was priced at £ 5,750, although the university valuer valued it at £5,500. We managed to bring the price down to £ 5,650, which meant that we had to, ourselves, put down a payment of £ 150, the balance of £ 5,500 coming from the Cambridge Building Society and the University of Cambridge in the 80:20 ratio. We also had to pay the solicitor's charges which amounted to around £ 200.

The process of buying-selling houses in the UK has a very streamlined procedure and I do not recall having done any running round or worrying about legal documentation. All formalities were handled by our solicitor. On April 22, 1968 we became homeowners with the house key in our hand. We had arranged for a removals truck to take the heavy stuff like fridge, washing machine, books, etc. With our own car and Chandra-Priya's car we did some 15 rounds between 4 Croft Gardens and 21 Tavistock Road. We invited C & P for the first meal in the new house. We could find a tape of *Geeta-Path* (chanting of the verses from the *Bhagavadgita*) to play on the occasion. It is customary to invite a group of Brahmins for a meal on such occasions. We argued that Chandra and Priya were there as Buddhist *Bhikku* and *Bhikkuni*!

The internal work in the house required some painting and wall-papering, besides placing towel rails, small shelves, etc. Living in Cambridge one learnt to be self-reliant and so we did these jobs ourselves with some help from Chandra and Priya. I recall that we spent time into the early hours of the morning doing some painting and flooring jobs. We found that the 'Do It Yourself' shop in the Shelford village stocked all the stuff we needed for our purpose. The work on the insides of the house went on for several days and nights, mostly on weekends.

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As the summer was approaching, we thought of reshaping the garden too. The back garden had a wilderness section with a lot of random shrubs. We removed these and replaced them by a lawn. We found a nursery that sold rectangular 'tiles' of lawn and we got these delivered and then ourselves laid them out as we wanted. George Salt came and advised us on how to make a section of the back garden into a vegetable patch. He saw that there was a willow tree next to the back wall of the house and said that it was too close for

comfort. The tree was not more than ten feet tall and was expected to grow. Also its roots were also expected to hit the walls of the house. Following George's advice, I decided to shift the tree farther from the wall, in fact all the way to the end of the garden. I dug around the base so that the roots would not be harmed and extracted the tree and then carrying it singlehanded to its new destination, placed it in a pre-dug pit.

In general, Mangala and I enjoyed working in the garden which also provided exercise of its own kind, all in fresh air. The periodical chores were mowing the lawn, and weeding, which were my share of the work. After I dug out the vegetable plot as per George Salt's instructions, Mangala liked to work in this 'kitchen garden' growing vegetables and herbs. We also planted some rose trees in the front garden, and had different flowers growing at different times of the spring to autumn interval.

Around this time, we had a short excursion with Chandra and Priya to Spalding. In early May, the tulip fields in the neighbourhood of this eastern town get in full bloom and are a pleasure to watch. These tulip fields are said to be similar to those in Holland which also bloom around the same time. We got an opportunity to see the Dutch fields much later, in 2004.

On the 30<sup>th</sup> of May, we had a small 'house warming' dinner party to which eleven people came. Rather than have a big party we had decided to invite our friends in small groups in stages. But this occasion made us feel that we were now well settled in our new abode, a house we could call our own.

One link with the past surfaced this summer for me when both Mangala and I ran into Mrs Fordham, my landlady from 200 Mill Road. She had been under the impression that I had returned to India for good and we were delighted to renew contact with her and her family.

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I had missed the summer at IOTA the previous year (1967), when the buiding was getting ready. The 1968 summer was the first one when we had the full component of visitors from Europe, North America, Australia, etc. Especially, an international conference on cosmic rays hosted by IOTA brought several visitors from all over the world. I was happy to welcome the TIFR delegation of Devendra Lal, Roy Daniel, Yash Pal and Krishna Appa Rao to our house for a meal during the conference.

My research work was progressing well and Fred and I had completed a major paper in which we could show that the Wheeler-Feynman action at a

distance theory could be adapted to describe quantum phenomena. This was a major piece of work, which was eventually published in the US journal *Annals of Physics*. We later followed this work by another even more important and general paper in the same journal. These papers appeared in 1969 and 1971 respectively.

My interest in radio source counts had continued and both Fred and I were interested in further data from Ryle's group on their future surveys. After the blow up of controversy in 1961 the matter had remained in low key. That survey was the fourth one to be conducted by Ryle's group and was called the 4C survey. However, in 1968 summer, we learnt of a new, 5C survey from the Cambridge group and so we invited Martin Ryle and his colleague Guy Pooley to present the work at an informal IOTA seminar. Ryle, Pooley and Peter Scheuer came with their data but when Ryle saw the audience he turned round and said that he had not come ready for a seminar but would discuss the data informally with Fred and me only. So we sat down in a small seminar room all by ourselves and looked at the data. By then it was becoming clear that the counts were certainly 'levelling off', that is, there was no more of the earlier feature of counts of fainter sources rising very fast as claimed earlier for 3C and 4C surveys.

I was invited to deliver seminars in several institutions in the UK and on some occasions Mangala and I drove together. On some other occasions I went by train alone. We also continued to travel in the country by car and a major trip that summer was to Devon and Cornwall in early summer. Highlights in this trip were the visits to the ancient remains of Stonehenge in Wiltshire and the Logan Rock in Cornwall. The former have been variously interpreted but I find Fred Hoyle's interpretation of the remains as an old astronomical observatory quite persuasive. The Logan Rock is a eighty ton boulder precariously balanced on the Atlantic shore cliff. Prior to its restoration in 1824, it could be made to wobble by giving a slight push.

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I had earlier been planning a visit to the University of Maryland along the lines similar to that of the previous year. Howie Laster was again the host. However, a domestic reason made us change the plan. In early summer Mangala became pregnant and we felt that we should stay put in Cambridge for the whole range of the pregnancy and so I wrote back to Howie Laster postponing my visit to a later year. This visit eventually took place in 1971.

As I have mentioned before, Anil and Suhas had got married later than Mangala and I did, but already in the winter of 1967-68 we had found that they were ahead of us in the next step of becoming parents. After returning from India in early 1968, Mangala and I took a conscious decision to start trying for a baby ourselves. Thus the news of Mangala's pregnancy brought a quiet satisfaction to us and of course a great deal of joy to our elders back in India.

Dr Apthorpe Webb had been our family physician right from the time I had come to Cambridge as undergraduate and he assured us that the pregnancy was proceeding normally and we could register Mangala in a private nursing home for delivery. Although there was a good maternity hospital in Cambridge run by the National Health Service, it was generally prioritized for the lower income groups, or for those pregnancies where complications were suspected. Since Mangala's case fell in the 'routine' class, we accordingly made a reservation in the Evelyn Nursing Home for mid-January 1968, the expected D-day.

Despite regular periodic check ups with Dr Apthorpe Webb, and his finding that everything was proceeding normally, we were in for a shock in the beginning of October. In late September, Mangala started feeling slight ache in her stomach and we went to our doctor's surgery. Unfortunately, Apthorpe Webb was away that day and his colleague Dr Gawyne was there. He checked her and prescribed some simple remedy which seemed to help. However, on October 1, she had more pain and she decided to take rest. The next morning the situation seemed to worsen and we called Apthorpe Webb who came soon and did an examination. He suspected the onset of a miscarriage and called for an ambulance. Mangala was taken to the Maternity Hospital and there rushed to the emergency section. Unfortunately the miscarriage could not be prevented and the baby born was too young to survive.

Both Mangala and I were deeply shaken by this mishap, for which we did not know the reason. At the time the specialist doctor in the Maternity Hospital advised us not to get discouraged and try for a baby once again after Mangala had come back to normal.

This was shattering news to our elders back in Poona and Bombay. They all advised us to visit India so that Mangala could have rest and she could also see experienced doctors to find out what precautions to take next time. I already had a standing invitation from Vikram Sarabhai to visit PRL and I wrote to him proposing a two month visit to which he readily agreed. So I decided to spend the months of December (1968) and February (1969) at

PRL. I also wrote to Abdus Salam for a visit to his International Centre for Theoretical Physics (ICTP) in Trieste. I suggested visiting the ICTP on our way back from India.

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Our visit to India was also particularly looked forward to by my parents because Anant was also planning to come to India then. He had left the job at Lancaster and joined an institute in Geneva. While there, he had received a cordial invitation from Appasaheb Powar, the Vice-Chancellor of Shivaji University, newly established in Kolhapur, to come as Head of the Physics Department. He decided to take this offer and was returning to India for good. Thus we would have a real family reunion in December.

On the way back, we decided to spend 3-4 days in Egypt. We stopped in Cairo and arranged for a tourist agent to provide us with an English speaking guide and a chauffeur driven car for sight-seeing. This visit went off well and we had a good exposure to the main tourist spots in and around Cairo. The pyramids and the Sphinx, the main mosque in Cairo, the Museum with its treasure of Tutankhamen, the step pyramid of Sakkara, boat on Nile, etc. were part of what we saw. There were, however, two experiences that we cannot forget. The first day was the day of Ramajan fasting and our guide, being a Muslim had not taken any food, even water during the day. At his recommendation we went to a well known restaurant at the early hour of 4.45 p.m. We ordered food which was served at our table. However, the guide requested us to wait till the main Mullah gave a green signal on the radio. We noticed that most of the tables were full and diners were eagerly waiting for the radio call to the faithful to break the fast. Some had even tucked in their serviettes and were ready with knife and fork in hands. As soon as the call came on the radio, they, including our guide, literally pounced on the food!

The second incident was when we were contacted by the Indian Embassy in Cairo on behalf of the ambassador, Appasaheb Pant, the Prince of the erstwhile State of Aundh in Maharashtra. Mr Pant had learnt that we were in Cairo and wanted to get in touch with me. This contact led to our being invited to an excellent dinner in Mr Pant's house, followed by a slide show of what were the sight-seeing spots in Egypt. I gathered from independent sources that Mr Pant had been very welcome to the Egyptians as an ambassador for India, since he had taken pains to know their country well. He wanted to

arrange my visit to the Cairo University, but because of shortage of time, I could not do so.

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Our visit to India was a mix of visits to Bombay, Poona and Ahmedabad. My parents were indeed pleased to have Anant as well as us around at the same time. We were together in Poona and then moved to Ahmedabad via Bombay. In my first month at PRL, Mangala had also come with me and she enjoyed the time spent there, making friends and doing sightseeing. A memorable part of this stay was the trip to Mount Abu in the company of Devendra and Aruna Lal from TIFR. Mangala was recovering from the shock of losing our first child but healthwise she was back to normal. Still, both of us knew that we would not be satisfied till we knew the cause of the miscarriage.

Fortunately for us we got the solution to our mystery, when we went to see the renowned gynaecological expert Dr V.N. Shirodkar. He carried out an examination and then gave the answer. The miscarriage arose because of 'incompetent cervix', i.e., the cervix that could not remain closed till the delivery time. He explained that the cervix is like a bag holding the foetus and the bag needs to be shut while it grows. If the muscles closing the cervix are loose, they allow the bag to be opened and the foetus to come out before it had grown sufficiently to survive in the outside world. As it happened, it was he who had discovered this defect that had led to miscarriages in several cases with history like Mangala's. And more importantly, *it was he who had found the solution to this problem*. The solution was amazingly simple, yet fully effective: to stitch the mouth of the cervix and to remove the stitch in the 37<sup>th</sup> to 38<sup>th</sup> month of the pregnancy. This particular stitch is known as the 'Shirodkar Stitch'. So we could not have gone to a better person to solve our problem. Dr Shirodkar gave a letter for the gynaecologist who would be treating Mangala in any subsequent pregnancy. We found that this letter was greatly respected, coming as it did straight from 'the Master'.

One highlight of our visit in India was the long awaited visit by Fred Hoyle. Hoyle was greatly respected in India and his books on popular science widely read by Indian students. However, his projected trip to India was getting postponed, until 1969, when the Kalinga Award brought him to India. This high profile award was instituted by UNESCO with donation from India by the Kalinga Foundation Trust operated by Biju Patnaik of Orissa. The award is given every year internationally for popularization of science. Very distinguished

luminaries had been previously Kalinga laureates; to name a few: Bertrand Russell, Margaret Mead, Julian Huxley, George Porter, etc. Hoyle was selected for this award in 1968 and was invited by the UNESCO to visit India during the year 1968-69. He came down in early February. After the award ceremony in Delhi, his itinerary included Bombay (TIFR) and Ahmedabad (PRL).

His talk on the origin of elements held in the newly built Homi Bhabha Auditorium of TIFR, was very well attended by general public. Taking advantage of his visit to PRL, the relativists in India, under the leadership of P.C. Vaidya, organized a meeting on general relativity and cosmology. Hoyle and I attended the meeting as did my father. This was an opportunity for Fred and my parents to meet, again, a meeting that both sides had long looked forward to but which was being postponed. Needless to say, they got on very well.

The relativists took the decision of forming the Indian Association of General Relativity and Gravitation (IAGRG) with my father as the Founder President. The IAGRG has been very active since then and holds a national meeting every year and a half, approximately, in different parts of India. Fred Hoyle was elected an Honorary Fellow of the Association.

This first meet was held at PRL during my second month of visit there. On this occasion Mangala did not accompany me but stayed back in Bombay and Poona. It was a pleasure for me to meet Vikram Sarabhai again and also to call on the Sarabhais at Shahibag, Anand and Suhrud with their mother Manorama.

Soon it was time to wind up our stay in India and make our way home, which was now at 21 Tavistock Road, Cambridge. Enroute to the UK, we stopped at the ICTP in Trieste, where I spent a week. The new buildings of the Centre had just come up and, though I missed meeting my host the Founder Abdus Salam, I could get a good look at the organization. It was an excellent place for scientists from developing countries to come and charge their ‘intellectual batteries’. Little did I imagine then that I would be called upon some two decades later, to set up a similar centre for Indian universities. We enjoyed visiting the Trieste town and eating pizzas there. The locals told us how to order a pizza that was spicy but not too spicy. We also made a short excursion into Yugoslavia, to look at caves with stalactites and stalagmites. The locals in Trieste advised us to make a day-trip to Venice which we found lovely and relatively quiet as the tourist season had not yet begun in the early spring.

These travels to India and the USA, while enjoyable and academically satisfying, invariably involved disruptions at home. Being householders, we saw that we needed to take several precautionary steps like closing tap-water input, ensuring that the plants in the garden would be looked at, informing the police in case we were going away for long, etc. So it took some days to settle down to routine again.

Returning from India, we were hit by an item of bad news at IOTA. Frank Westwater suddenly died, after some complications developed following a relatively minor surgery. This was a great blow to Fred, since Frank handled all day to day administrative chores that Fred wished to avoid, and *more importantly*, he had enjoyed Fred's confidence. Fred rushed back from California to be present at Frank's memorial service. Later the University appointed a new administrative secretary, a young man named Peter Vogan, who managed the work quite efficiently.

Earlier, Mrs Westwater had every kindly offered us the use of their cottage in Scotland for a stay anytime we planned to go to that part of the country for a visit. That summer we decided to visit North of Scotland where Fred was planning to spend some time with Willy Fowler and some other visitors from Caltech. Earlier, Chandra and Priya had suggested that we four travel together in their new car, a Ford Escort, that they were expecting to be delivered. However, the car did not arrive by the date of our travel and so we decided to go in our car instead.

It turned out to be a very enjoyable trip. We stopped in Edinburgh for one night when we were entertained to an Indian dinner by Chandra's friend Kashi Nandy, an astronomer at the Royal Observatory. We travelled via Inverness to Kyle of Lochalsh, where Fred was visiting. It was a remote part of Scotland near the Isle of Skye, and one could understand Fred's desire to work in a place where there would be no distractions. The stay at the cottage of Westwaters, which was not very far, came in very handy for our purpose.

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An important development took place on the family front: Anant decided to get married and selected Aruna Bhawalkar as his life's mate. Aruna was the youngest daughter of Dr D.R. Bhawalkar, head of the physics department of Sagar University, a venerated teacher from old times who had trained many bright physicists of our generation. Mrs Bhawalkar was a Sanskrit scholar and Aruna herself was doing a Ph.D. in English. They got married the following

year and chose June 21 for their wedding day, the same as ours and our parents' wedding days. Having been to India only a few months before, we were not in a position to attend their engagement or the wedding.

Another important development was when Mangala conceived again. This time, given her history, at the advice of Dr Apthorpe Webb, we went to the consultant at the Maternity Hospital armed with Dr Shirodkar's earlier diagnosis. Later Dr Shirodkar directly wrote to the hospital also. This time the doctor followed the recommendation of putting in the Shirodkar stitch at the early stage (around 14<sup>th</sup> –15<sup>th</sup> week) of pregnancy. So Mangala had a minor operation in late September.

In early October we had the long awaited visit of Mangala's aunt and uncle, the Rajwades, Balasaheb and Nalini. The arrival of Kaka and Kaku following the above surgery brought considerable cheer to us. They had three weeks in our house during which they did some outings and sightseeing. But the main objective of their visit was to see at first hand our house and how we were managing our little household.

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After returning from India in the spring of 1969, I began to give serious thought to my intention of returning to India for a permanent residence there. I had the promises made by the Government of India for help in case I took that decision: Both the Prime Minister Lal Bahadur Shastri and Education Minister M.C. Chhagla back in 1965 had assured me that they will welcome my return as and when I felt like coming home. I discussed this idea with Mangala and felt that we should not delay our return to beyond the next few years. There were several reasons.

First, my successive visits to India since 1965 had given me many indications that my parents would like me to be around nearby after my father retired in 1973 from his professorship at Pune University. Because of advancing age and increasing frailty of health my parents were growing less and less confident of managing on their own. Although Anant had gone back to India, I was not sure that he would be able to provide the kind of companionship that they wanted.

My second reason was that with the possibility of our having children in the coming years, we would be concerned with their education and it would be increasingly more difficult to make a transition from the west to India as they grew older. Thus we wanted them to be brought up in our home culture and environment as early as possible.

Irrespective of these considerations, a major feeling in my own mind was that despite the prosperity I was enjoying in the west, with house, car and a good academic atmosphere, I was like a guest in the house of a wealthy and hospitable friend, who lets me stay in a comfortable suite of room at his palatial residence. Although I may be enjoying his hospitality, I would not like to do so permanently. I would always have the feeling that I was a guest in the house. I would be anxious to return to my own humbler residence, even though it may be less comfortable and more chaotic to live in. So I felt that despite the much publicised problems of living and working in India, I should give the option a serious try, especially with the background of the welcome the Government of India had extended.

So, I took a bold step and wrote a letter to the Prime Minister Indira Gandhi, referring to Shastriji's offer and stated that I was contemplating returning to a research institute if conditions conducive to my research could be created. I was pleasantly surprised to receive her reply within a short time, in which she expressed her happiness at my decision to return, and promised to create conditions as I needed, if I would let her know my expectations in this regard. Whereupon, I wrote saying that I would ideally like working in the Tata Institute of Fundamental Research, Bombay, my second priority being the Physical Research Laboratory, Ahmedabad.

After a few weeks, I received letters from both Goku Menon, Director of TIFR, and Vikram Sarabhai, who was not only Director of PRL, but also the Chairman of the Atomic Energy Commission (since Homi Bhabha's death in a tragic accident) and as such also in charge of the TIFR in an administrative sense. Both welcomed my decision and offered to help. After some correspondence with Goku, I finally received a letter to join TIFR as Full Professor when I returned to India in 1972. For, Mangala and I had decided to make the transition in that year. This was the year ending the original period of IOTA when it was supported by the Nuffield Foundation.

Our decision to return was taken by both of us after full examination of the pros and cons. I knew that at TIFR I would have the high privileges of a professor, working in airconditioned comfort, living within ten minutes easy walk to the place of work which looked out upon one of the most stunning views enjoyed by academic institutions all over the world. Mangala knew that she will be called upon to manage a household with young children and my parents who were expecting to come and live with us. We both knew that back in India the reality under the veneer of the comforts of working at the TIFR covered a number of problems: managing on a much lower income, living in

an atmosphere of scarcities, moving in a crowded city with dust and heavy rains, being away from the centre of academic activities, and so on. There were plus points too: the respect and affection I enjoyed in general, having lot of help available from friends and relations, the relative ease of getting domestic servants, etc.

I chose to ignore comments from friends and acquaintances some highlighting the problems of living in India and others suggesting how I should ‘cash in’ on the support I was getting from the Government. Both Mangala and I wanted to have a simple lifestyle of an academic middle-class family with our children being brought up in Indian culture. We valued the benefits we had enjoyed in the West, and certainly looked forward to keeping our links and contacts in Cambridge and the USA going strong.

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We were anxiously following the progress of Mangala’s pregnancy. The slightest indisposition on her part would send me into fits of worries. Of course, the first child generally causes a lot of anxious moments to its inexperienced parents. In our case, the past history was the reason for extra caution. We were certainly relieved when Kumutai, Mangala’s mother, agreed to come for the delivery. Normally the first delivery is in mother’s parents’ house; in our case, we wanted the minimum of disruption in our routine and her offer to come was a double boon. As mother, she would be an asset anyway for Mangala to have around her. But additionally, she was a medical doctor and an experienced obstetrician. She ran a maternity hospital in Pune and her reputation in this field was spreading fast. Coming this far in assistance to her daughter meant she had to make arrangements for suitable doctors to take charge of her ‘cases’ during her absence of around two months.

We, therefore, arranged for her to fly by Kuwait airways, which offered cheap fares from Bombay to London. She had to change planes at Kuwait; but otherwise the flight was quite convenient. In February, I drove to London airport to pick her up, Mangala wisely staying at home. Kumutai had brought, nay smuggled, some alphonso mangoes hidden in her saree! For, when packing her bags in Mumbai, Kumutai found that her baggage was exceeding the weight-limit by a considerable extent, as she had stuffed it with items she felt necessary for a new mother. She had also put some mangoes in her carry-on bag (which also used to be weighed those days). Mangala’s uncle, Balasaheb sensed that this excess weight would lead to lot of charges to be paid to the airline and

insisted that she reduced her baggage by discarding non-essential items. Unknown to him and the airline, however, Kumutai brought those precious items for her son in law! Needless to say, the mangoes were doubly as precious to me for that reason. This incident is often quoted as an example of Kumutai's trait of doing what she wanted no matter what the obstacles.

As a medical expert she was satisfied with Mangala's progress. Not having the medical tests those days which foretold the sex of the foetus, she relied on her own examination, experience and intuition to declare that the child was a girl. However, for us the result would be known only on the D-Day and we would welcome the child whether a boy or a girl, with equal warmth. The Shirodkar stitch was removed by the hospital surgeon around two weeks before the due date.

On March 15, around a week before the D-Day, Chandra and Priya had come over after dinner for a round of bridge, men versus women, which the ladies won. Then they left and we watched a play on the TV and went to bed at 10 p.m. or so. Around midnight, Mangala began to experience pains which were identified as labour pains and on Kumutai's advice we telephoned the hospital and told them that we were bringing Mangala for admission. I drove Mangala and Kumutai in our Imp, and we duly admitted Mangala to the Hospital. The Staff Nurse in charge guessed that the baby would take twenty four hours to come out as this was the first child. So she advised Kumutai and me to go home and rest, suggesting coming again in the morning. Kumutai wanted to remain, as she suspected that the baby would come much sooner. However, we had no option but to follow the Staff Nurse's advice and so we two drove back.

At 5.45 a.m., our phone rang and the hospital informed us that the baby was imminent and so we rushed over. By the time we reached, however, the baby had been born and Kumutai was chagrined at having missed being with her daughter at the time of delivery. Mangala, however, had no great problem and was certainly very happy that her mother was close by now that she had to look after the new-born daughter. In her first letter home to my parents, she mentioned that the girl resembled her father, which she said "is an auspicious circumstance". Whatever be the interpretation, Mangala and I both felt very happy and satisfied to look at a healthy and very pretty baby. Her safe arrival made up for all the trauma and uncertainty we had been through.

We named her *Geeta*, after the Hindu scripture containing deep philosophy together with humanistic advice, a book we both admire. The name had to be decided within forty eight hours and the birth certificate with name

obtained from the Registrar of Births at the hospital itself. This is unlike in India where the parents take their own time in naming the child, sometimes several months. Knowing the British system, we had done our home work in advance on choice of names for both boy and girl.

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The first baby is always a challenge since the parents are facing the experience for the first time while, with the next one they have a *déjà vu* feeling. So while Kumutai was with us, we had a relatively relaxed state of mind. She gave us practical information on various issues of day-to-day handling of the baby: feeding, sleeping, bathing, etc. Normally, Mangala would have been discharged from the hospital within a couple of days; but because of her special condition (the Shirodkar stitch) she was kept for nearly a week. After coming home we quickly adapted ourselves to the new routine.

One important event we wanted to get over with while Kumutai was with us was the formal naming ceremony. This is normally performed on the twelfth day. We decided to do it on the 28<sup>th</sup> of March. As luck would have it, Gajanan Desai, an old friend of Mangala's uncle Balasaheb Rajwade (and a school chum of my uncle Morumama) was around in England and he offered to play the role of the priest! We needed five married ladies to bless the child and we had Priya, Meena Adarkar, our neighbour Millie, Patricia Aarseth and Dorothy Eggleton in that capacity. Geeta was passed round the crib as per the ceremonial and duly named 'Geeta'! Kumutai also named her 'Mukta'. There was a tea party for the invited and we had some movie and photography too.

Kumutai felt that her role as facilitator was coming to an end and she was getting impatient to get back home to attend to her maternity home and lectures in the Tarachand Hospital. But she wanted to do a brief tour of Paris before returning, since apart from London and Cambridge, she had not seen much of the foreign land. We were worried as to how with her austere ways of living, a strict vegetarian diet and lack of knowledge of French, and limited knowledge of English, she would manage such a trip. However, fortunately, a lady of her age from Poona, Mrs Malatibai Joshi happened to be passing through the UK and offered to accompany her since she too wanted to see Paris. This greatly relieved our mind and we sent her on a prepaid (travel + accommodation) trip to Paris with Malatibai. They enjoyed their visit, subsisting on bread and fruit and milk products mainly. They could see the tourist attractions of Paris and Kumutai came back satisfied that she had seen something of the West.

So on May 13, on a sunny morning, I drove Kumutai to Heathrow Airport and saw her off on her flight to Bombay, again via Kuwait. As she disappeared behind the immigration barrier, I had a feeling that we were now on our own and we had to manage a few week old baby! We had Dr Benjamin Spock's book on *Baby and Child Care*, which we had studied extensively as a 'Bible' for us. We found its replies to several questions about the baby very informative and often reassuring. We also found its various tips on what to do and what not to do very relevant to our problems.

Amongst the many friends who dropped in to see baby Geeta, we particularly recall the visit of Morgan Forster, now in his ninety-first year. Morgan had been subject to attacks of what he lightly described as 'fits' and 'nothing so grand as a stroke', when he had to be hospitalized till he regained control of his limbs. We had seen him in such states and admired the way he coped with these shocks. He had become increasingly dependent on the Buckinghams, Bob and May, and often recuperated at their Coventry home. He was in good condition in April, well enough to stay in his King's rooms and he wanted to see Geeta. So I had brought him to our house for tea and he had a good look at the baby, whom he hesitated holding in his arms. He was impressed by the largeness of her head and kept muttering "What enormous head!". I explained to him that all babies have heads in much larger proportion to the rest of their body, compared to adults.

The photograph I took of Morgan with Geeta was most likely the last one in his life. For, in a few weeks, on June 7, 1970, he passed away. He left a gap in my life since over the last seven years we had shared many discussions, attended theatre together, had meals side by side on the High table, and exchanged philosophies of life. I was always impressed by his quiet demeanour, taking a kinder view of life and taking the rough with the smooth. Unlike many old persons who keep complaining, Morgan tried to look at the brighter side of life. As our mutual friend George Salt used to say: "I would like to grow old like Morgan!". His passing away was a national event with tributes to him pouring from the high and low on the land. Because of his Indian connection, there were several tributes from Indian leaders, including from the Indian High Commissioner to the UK.

Meanwhile we were learning a lot as we saw Geeta grow. We wished that she had sounder sleep. She would wake up at the slightest sound, a trait she still has today! But we recall the first evening we were bold enough to invite some friends for dinner. We had 'trained' Geeta to have bath and feed and fall asleep by 7.30 p.m. and so had arranged for our dinner guests to

arrive by 8 p.m. That evening, we breathed a sigh of relief when we put Geeta to bed and saw her go to sound sleep by 7.35 p.m. As I laid the dining table, the guests started to arrive by 8 p.m. Unfortunately the doorbell sound woke up Geeta. We had not tested her sleep against the doorbell sound and this was a lesson for us that one needs to cover all eventualities for a perfect planning. The result was that Mangala and I had to take turns keeping Geeta amused, even taking her pram for a short trip into the garden. So at any time only one of us could attend to our dinner guests. While we profusely apologised to the guests, they all took this in their stride, since they all had passed through child rearing experience. As Peter Eggleton, one of the guests who had a five year old daughter to look after, said: "I am told that only the first twenty years are difficult".

I got to learn to be a supportive father and could do most of the baby chores, like nappy changing, bathing the baby, feeding her with a bottle, taking her out in her pram, putting her to sleep singing a lullaby, etc. This is nothing to boast of abroad, but was not generally done by Indian fathers. This experience came in useful when years later I was called upon to play the role of a supportive grandfather! I also found a way of placing Geeta's carry-cot behind the back seat against the rear window of our Hillman Imp. That way we could drive short or long distances. Today, the rules of how one can carry a baby in a car are much more stringent and my prescription, although quite secure, would not be acceptable. We thus got more and more 'mobile' although not to the extent of, before we became parents.

Nevertheless, we decided to try and manage our lives as best as we could while taking care of our first-born. So when the IAU Symposium in Upsala was announced and I was invited to attend, we arranged for us to travel to Upsala with Geeta. Mangala soon found that managing a child outside home has its own problems and she was having to miss some programmes for the accompanying spouses. Fortunately, Mrs Nicolson, the wife of a South African Radio Astronomer who was expecting a child and was not keen to attend the banquet, offered to baby-sit for Geeta, so that Mangala could attend the banquet. She accomplished that feat with flying colours!

When Geeta was six months or so old, we decided to move her to the small bedroom which had been equipped for her with a crib and toys and nursery furniture. While she was happy to be there during the day, she raised howls when made to sleep alone at night. Following Dr Spock, we went through three or four nights when she cried and cried and finally went to sleep when we did not respond. We felt very heartless, treating her this way; but as Spock

had argued, the parents have to display firmness so that the child can understand that the crib was his or her rightful place to sleep.

Just as we had taken the decision to buy a house so did Chandra and Priya. We used to tease them as 'copycats'. They followed us in another respect: they had their first child in October, 1970. Anil Wickramasinghe was a good playmate for Geeta as they grew older.

## BYE BYE CAMBRIDGE!

After Upsala, we planned an even longer trip abroad, in the winter of that year. As grandparents and other relations were all keen to see our first-born, we decided to make a 6-week trip to India in the Christmas vacation. We had gone to India in early December in 1967 and 1968. This time, however, we were travelling with a nine month old baby. We had booked on a charter flight run by Air India as it gave reduced fare. The plane was very full, with the result that the airline informed us that we could not carry the baby's carry-cot into the main cabin. We had to leave it with the airline folded up and we would receive it in Bombay. This was a blow, since we expected to use the carrycot to sleep Geeta during the flight and now we had to hold her ourselves.

However, we somehow managed and made it to Bombay not too late. The Rajwades were there to welcome Geeta and us. However, Geeta would refuse to be carried by anyone else than her mother, and on some occasions (if the mother was not in sight) by her father. It took her some time to get used to the new faces she saw around her. The same evening we went by the Deccan Queen to Pune and at the Kirkee station my parents had come to receive us.

Here too Geeta refused to be carried by anyone else except her parents. However, after a couple of days she got used to Tai and to my father. The main problem we faced was how to give her a bath in a 'user-friendly' way. For, invariably she found the surroundings of the bathroom in a new place unfamiliar

and started crying. We finally found that she liked to use the baby-walker that my parents had brought for her use and she could be bathed with relative ease sitting in it.

In Pune I also discussed my future plans with my parents. Although there was an offer from Poona University for me to step into the same professorship that my father held, I preferred to work in TIFR. I planned to join TIFR in October 1972. My parents would come to live with us after my father retired in 1973. When in Bombay I visited TIFR on a Sunday and called on Goku Menon in his office. As he had many assignments in other places, he often worked at TIFR on a Saturday or Sunday. He explained the working conditions at TIFR and how I could adapt my work pattern to it. He stressed that collaborations like mine with Hoyle abroad were welcomed and I could visit abroad in connection with it fairly easily. He then sent me to see Roy Daniel in his flat, since the flat I would have to start with would be similar. He had plans to build larger, three bedroom flats for senior faculty and hoped that I would be able to move into one not long after joining. The flat and the whole building housing 99 flats was very pretty and kept clean. I was quite impressed by these and more so as the hustle and bustle of Bombay seemed far away.

While we were enjoying the pleasant winter of Poona and Bombay, the Cambridge weather was unrelentingly cold. In an urgent message Chandra and Priya, who had promised to check our house from time to time, informed us that the pipe to the water tank had burst and there was flooding in the house, especially Geeta's room which was damaged. They had turned off the main tap into the house to stop further damage. Anyway, they asked us to proceed with our holiday as planned as the matter could be rectified after we returned.

This was a blow but we decided to face the music when we returned to Cambridge. Another problem was to hit us then, although we did not realise it in India. When we were in Dadar staying with the Rajwades, Pratap caught chicken pox. We both had gone through that before and so did not stand a chance of contracting it from him. However, we were worried about Geeta and decided to move back to Pune, much to the disappointment of the Rajwades and to some extent, of Mangala also. We thought that with this precaution we would protect Geeta from acquiring the infectious disease.

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After returning from India in early January, we had to get ready to visit

the USA for six months or so beginning in March. Of these one was to be spent in Cornell, four in Maryland and one in Caltech. However, the first item on our dish was the restoration of normalcy to the house after the water disaster. The Wickramasinghes already had a plumber rectify the water damage and we called a builder to rectify the civil damage. We also had the insurance representative come in and approve the repairs for settling the bills. Fortunately there was no difficulty at any stage and we had the house liveable in ten days. Meantime we were very kindly put up for the first two days, in their house by the Wickramasinghes.

However, soon after we moved back into our house and were getting back to normal routine, Geeta developed high fever followed by rash, which was identified by our doctor as chicken pox. So our precaution in avoiding Bombay had been in vain. We consoled ourselves that it is good for the child to develop immunity by passing through this stage! We made sure, however, that Anil Wickramasinghe was isolated from Geeta to prevent him acquiring the disease.

Meanwhile we were getting ready to fly to the USA and wondering what to do to the house while we were away. Mrs Burkhill, the wife of the Peterhouse mathematician J.C. Burkhill, who played the samaritan for visitors to Cambridge, solved our problem by suggesting that we rent our house to one Dr Rathbone who was to be in Cambridge from early March for 4-5 months. This suited us very well, for the house would be looked after and we would also get some rent. This was similar to our renting 4 Croft Gardens to the Wagoners in 1967. This time the Wagoners were to be our hosts in Cornell.

Again we managed to get a suitable chartered flight from London to New York. I rented a car to be left at Gatwick airport, where we were to take the flight. We drove over reaching our airport hotel in late evening. I left the car with the car rental finn, after we had checked in for the night. We were to take the flight to New York the next morning. We reached JFK airport in early afternoon and from there went to the Port Authority Bus Terminal to take a bus to Ithaca. After deciding which bus to take, I telephoned Bob Wagoner, who promised to come to meet us at the Ithaca bus stop. He had already fixed a nice one bedroom furnished apartment for us, within walking distance of the campus. So we had no difficulty settling in.

The Ithaca stay was very comfortable, except for weather which was very cold by the UK standard. It was a stark contrast from the very balmy spring weather I had encountered in late May, 1963 during the *Nature of Time* conference. It was here that Geeta started walking. We had taken movie of her

first steps and it is amusing to watch it even today. The Wagoners were very hospitable and looked after us very well. I also met Ed Salpeter whom I had met during his earlier visits to Cambridge. Although I gave seminars on my work here, my interaction continued via action at a distance with Fred in Cambridge! We were close to completing our work on quantum electrodynamics, using the Wheeler-Feynman approach as enlarged by us.

While in Cornell, we took a week off to go to Canada, making sure that we had multiple-entry US-visas (*see* Chapter 22). We went first to Windsor where I described my action at a distance work. It was specially interesting for me to come here to meet Jack Hogarth whose work in 1961 had triggered Fred and me to work in this field. I recall driving to Windsor through a stormy wintry weather: at one stage one of the windscreen wipers blew away! Fortunately, it was the one on the passenger's side. On reaching Windsor, I got a new one put in. We then drove to Toronto where also I delivered a seminar.

From Ithaca we went to Maryland and here we rented an apartment on Greenwood Avenue in Tacoma Park with the help of Charlie Misner. The landlady, Mrs Einbender looked a formidable lady, but we found that she was very friendly. We were not sure how she will react to having a child in the house, but she welcomed Geeta with open arms. Her ten year old grandson Ronnie was equally friendly and often played with Geeta.

Our main local contact was, of course Rajan Devadas, in whose apartment on the 16th Street, Washington DC, we stayed initially until we had this apartment. Rajan also helped us buy a car, which made us mobile and self-reliant. The Tacoma Park area was popular with the Seventh Day Adventists and we ran into people who had been to the Spicer College, which was set up by this religious group in Poona. The Devadas kids had grown since 1967: there were additions to their numbers also! They all played with Geeta, who was like a doll for them. We recall taking part in their 4<sup>th</sup> July Fireworks display at Greenwood Avenue. However, unlike in 1967, when we and Chandra-Priya were childfree couples roaming freely around the Maryland-Washington area, now our movements were much restricted. But still we enjoyed our stay enormously.

From here we went to Los Angeles, stopping on the way to see the Grand Canyon. Here we first went to Las Vegas where we were to take a small plane to the Grand Canyon airport, where we were to stay in Fred Harvey's motel. It was very hot outside as we waited for our flight at Vegas. There Geeta spotted a low-level water dispenser. She was thirsty and could reach the paper cups placed there for water. I filled her a cup with ice cold water, which she enjoyed

drinking. Later I too decided to help myself. A little later, Geeta had another glassful followed by me likewise. Mangala was watching us as we drank several glassfuls to satisfy our thirst, but she herself did not take any water. As we got into the plane, however, I saw the wisdom of her abstinence. For the flight through the canyon was bumpy and both Geeta and I got sick! Although it was a scenic flight, I regret that I was in no position to enjoy it and was glad when our plane finally landed on the terra ferma. There our rented car was waiting and we had a good round of the Canyon area for the two days we were there.

At the Los Angeles airport, we were met by Peter Eggleton with a Caltech car which brought us to the apartment found for us by him. It was an ultramodern apartment with a variety of mod-cons. I was looked after at Kellogg Radiation Laboratory by Kip Thorne whose group listened to my detailed talk on the Hoyle-Narlikar theory of gravity followed by discussions over a session that lasted four hours. Mangala was delighted to meet her school friend Ajita Kale and her husband Ashok Kale, a medical doctor who had come to LA the previous year. This was the beginning of their sojourn in the USA which was to become their new homeland. Ajita and Ashok had two sons of which the younger one was nearly the same age as Geeta. It was a pleasure to visit the Disneyland with them although, the kids seemed scared by some of the more noisy and dynamic exhibits. We also met Kimiko Devadas's brother George Asawa, who took us round sightseeing LA.

I was happy to learn that the Adarkars, Dileep and Chitra were still in the LA vicinity and they very kindly invited us to a meal. They had three children, Swati, Ashvin and Sachin, older than Geeta. We also had a day trip to Santa Barbara with the Kales. I had arranged to visit Peter Strittmatter and the Burbidges at La Jolla and Caltech provided me with a self-drive office car. It was a big car and since my work was on a Friday, I could keep it till the following Monday, since the local office was closed on weekends. We found this arrangement very useful and used the car to visit the Lion Country Safari with the Kales.

At this stage, Geeta gave us a fright! After the Sata Barbara trip she contracted high fever going up to 104 F. She seemed in no trouble herself and was running around. But as the fever persisted for a couple of days, we consulted Ashok Kale. He, however, was not in favour of giving any antibiotics and prescribed baby aspirin in case the fever went above 102 F. Fortunately, after a couple of days her fever disappeared.

Thus it was soon the end of August, when we were due to fly back to

the UK. We had managed to get a direct flight from LA to London on a chartered airline, at very reasonable cost. We had to become members of the 'Los Angeles Professional Club', in order to qualify for the flight! We had bought an army trunk which we filled with most of our heavy items of baggage and shipped it to Cambridge by sea. This enabled us to travel by air within the prescribed baggage weight limits. The flight was uneventful, and we came back to Cambridge as planned.

Both of us knew that our next major journey would be the celebrated passage to India.

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The University had been concerned with what to do with the Institute of Theoretical Astronomy, after the grant from Nuffield Foundation ran out. This was expected to happen at the end of July, 1972. Being in the USA, I had missed a major 'cultural' event at IOTA: the sixtieth birthday of Willy Fowler. A party had been organized at Cambridge where Willy was visiting and he was presented with a scale model of a railway engine. Willy was a railway fan and had travelled on world's major rail routes. He very much appreciated the gift.

During that summer there had been several formal and informal discussions on the future of IOTA. The consensus was emerging that the excellent success enjoyed by the Institute had generated a solid momentum that had to be continued. The Observatories next door, had however, remained statically mired in their old traditions. Observational astronomy in Britain was, however, due for a leap forward with the Anglo-Australian Telescope coming on line by 1973. The Isaac Newton Telescope at the Royal Greenwich Observatory, inaugurated in 1967, was performing below the satisfactory level because of its poor site and would be shifted to La Palma in 1979. The decision that the University took was to merge IOTA and the Observatories together into a new 'Institute of Astronomy', to be supported by the University.

However, the University had no funds to support the staff positions and it was expected that they will become 'soft money' posts, i.e., posts supported by project money from DSIR for limited periods. The University would support only its existing posts like that of the Plumian Professor, the Observatory Director, etc. In short, the institute would continue but in a low key. It was also agreed that the headship IOA would rotate between the two professors, the Plumian Professor and the Professor of Astrophysics and Head of the Observatory

Fred was not happy with this decision, although viewed retrospectively some three decades later it was the best that could be taken at the time. At the time he saw it as reducing his influence in shaping astronomy at Cambridge. Moreover, it also became important to him as to who was to head the Observatories. For, his friend and long time colleague R.O. Redman was due to retire in 1972. In his attempt to bring expatriate Britons back to the mother country to reverse the brain drain, he had managed to bring Margaret Burbidge to the RGO as its Director: Margaret was to move from La Jolla to Sussex in 1972-73 to take up this position. Likewise Fred was trying to get Wallace Sargent to come to Cambridge as successor to Redman.

At this stage, events took place that could very well have come out of the pages of C.P. Snow's novels on Cambridge politics. In Cambridge University, all chairs have committees of selectors, *regardless of whether the chair is to be filled or not*. The members to these committees are duly appointed for 3-year tenures in a staggered fashion so that each year one third of the members are replaced by new appointees. All this is laid sown in rules and these were designed to prevent any improper use of such committees when actual appointments are made.

In 1971, two members retired from the Committee and were replaced by new ones. Those who retired were friends of Fred while those who came in their place were not. Rather, they happened to be friendly to Martin Ryle, with whom Fred had had severe academic wrangling in the past (*see Chapter 15*). So he viewed their appointment as a conspiracy against him, as a step taken to influence the choice of Redman's successor. In 1972, when the issue of filling Redman's post came up before the committee, they had other names besides Sargent's and they picked a theoretician Donald Lynden Bell. Although he had done some observing he was better known for his brilliant theoretical work. Thus although Fred had no problems with him on the personal front, and admired Donald' theoretical acumen, he viewed the choice as inconsistent with the qualifications required for the post, namely a distinguished career in observational astronomy.

The situation thus brewed on and ultimately Fred could take it no more. It is said that he was on a flight to Australia when the news of Lynden Bell's appointment reached him and he forthwith sent his resignation to the Vice Chancellor. Unlike in 1964, when he had threatened to resign and then withdrawn his resignation on request from the VC, on this occasion his step was irretrievable. He felt that he had had enough of Cambridge politics and opted out of the system. In his remaining life he woud never have a tenure job

and lived the life of an academic recluse, although he continued his prolific work.

I personally think that this extreme step was uncalled for and Fred should have continued actively in Cambridge. His very presence was inspiring for the younger generation who were to visit IOA (for, IOTA had become IOA after July 1972). By being part of the system he could have received better support for his various academic projects. As he thrived on collaborations, being in saddle in Cambridge he would have found it much easier to forge these to his advantage. But, Fred was Fred and being Fred, could take the only decision that he actually took!

At the time he confided in me stating that one of the attractions for him to continue at Cambridge was my presence there, since our collaboration had been going pretty well. However, since I had decided to move to India, he felt that that tie binding him to Cambridge was weakened. He promised that we could still collaborate but that, naturally, would not happen in Cambridge. He turned out to be correct on this count. Coincidentally, I left Cambridge on September 8, 1972 and he did the following day.

For me this was a shock in terms of my academic future. As many of Fred's friends and collaborators, like Fowler, the Burbidges, Don Clayton, John Faulkner, Peter Strittmatter, Chandra Wickramasinghe, etc., I realized that the Camelot days at Cambridge were over. Indeed, even though the IOA eventually prospered and made name internationally, the old magic of the period 1966-72 could not be recaptured.

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The autumn and winter of 1971 brought horrendous reports of repression in East Pakistan, by the Pakistan army. The disturbances had started with demands for greater say in the governance of the country by the Eastern part of Pakistan. The matters had come to a head after the elections in both the wings of the country. Mujibur Rahman's Awami League party had almost total victory in the East while Zulfikar Ali Bhutto's Pakistan People's Party prevailed in the West. Taking the National Parliament as a whole, Mujib's party had more seats and so he was entitled to be the Prime Minister of the country. This was unacceptable to Bhutto and the politicians of the West Pakistan who had till then enjoyed domination of the country. The President Yahya Khan, again from the West took this dissension as an excuse to annul the elections. This led to major civic disturbances in the East and Sheikh Mujib declared separation of the Eastern wing and named it *Bangladesh*.

This led to Pakistan army being sent to the East and a general repression and mass killings. There were hosts of refugees into India and the then Prime Minister had to take notice of these disturbances. It was no longer possible to treat them as internal matters of the neighbouring country. After trying fruitlessly, several diplomatic channels for intervention to stop these mass killings and lootings, she took the bold step of an armed intervention. The native Bangladeshi army and political leaders (Mujib had been imprisoned in West Pakistan) wanted India to intervene in their cause and they provided underground support for the Indian army. The operation was clinically handled and within two weeks the country was liberated. The Pakistan army under the leadership of General Niazi surrendered on December 16. The nation of Bangladesh was duly created. Sheikh Mujib had to be released from the Pakistan jail and made a triumphant entry into his newly created nation.

We were anxiously following all the developments on the British media, especially the BBC TV network. The reports and interviews and discussions with strategists were very interesting to listen to. I recall one day a Pakistan army spokesman was being interviewed and he claimed that 104 Indian planes were shot down in an air-warfare. He was asked how many planes were lost by Pakistan? To this the answer was ‘Four planes’. This was clearly not true, and to drive home his scepticism, the interviewer commented that 104 for 4 sounded like a cricket score. Not detecting the irony of the comment, the spokesman for Pakistan said in agreement: “Yes it is like a cricket score!”

We were worried about the family of Jamal, which hailed from Chittagong in the East and some of whom lived in Dhaka. They were known to be pro-Mujib and would have suffered under the repressive regime. Jamal and Suraiya were in the USA at the time and so we did not have information on this issue. However, we came to know that one of Jamal’s sisters had to enter India as a refugee.

But tragedy hit us closer to home in this war. Pradeep Apte, younger brother of Prakash Apte whom we knew in London was in the Indian Air Force. He did not come back from one of the IAF sorties into West Pakistan. Later it became known that his plane was hit and although he ejected to ground, he was killed in ground combat.

The winter into 1972 carried another traumatic experience for us. The coal miners in Britain went on a nationwide strike and as most power stations in the UK were coal-fired, the power supply soon ground to a halt. To preserve some emergency power supply going, there were severe power cuts. Different parts of the city had different 3- hour periods when they had light and when

they had not, the plus and minus being alternatively phased. We discovered that ours alternated with those of the Wickramasinghes. So, when we had light, they would come to our house and vice versa. The nightmare was finally resolved through talks between the miners and the Prime Minister Edward Heath. The PM had to give in to most demands, although the government got its own back a decade or so later, when the Prime Minister Margaret Thatcher brought in draconian legislation curbing the powers of trade unions.

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Mangala and I wanted to come back to India after we had another baby in Cambridge and our departure date was underlined more firmly when Mangala declared that a second baby was on the way, expected in the month of May, 1972. She had to undergo the minor surgery of the Shirodkar stitch and this was done at the Maternity Hospital as on the previous occasion.

Indeed, Geeta had been progressing nicely and we were past the problems of sleeping, feeding, and others that trouble babies. She was 'potty-trained' in due course and this removed a major chore of nappy-changing. She started going to a play group and was generally a sociable child. Fortunately there were kids of comparable age in our neighbourhood whom she met regularly and with whom she got on well. Of course, the boy she got on best with was Anil Wickramasinghe, some six months her junior, but a very active kid nevertheless.

To deal with household cleaning chores, we wanted to have a 'help'. Mr Ellis, the porter in King's, recommended one Mrs Sebley who lived not too far from where we were. She was a nice cheerful lady who did the cleaning jobs thrice a week. She occasionally baby sat also when both Mangala and I had to be out. She got on well with Geeta and presented her with a large baby doll, whom Geeta named 'Baby Sophie'. In addition we had also brought for her a baby boy-doll whom she had named 'Baby Johny'.

On the previous occasion we had the benefit of having Kumutai with us. Now also we needed some help at least in early days after the baby was born, since we now had to manage a two-year old also. We were fortunate here too! For our London friend, Madhu Abhyankar came out with a solution. His wife Sulu was also expecting a baby which was due to arrive a few weeks ahead of ours. Madhu's mother was coming to help Sulu on this occasion and Madhu suggested that she could be spared to help us when our baby arrived. This was a very reassuring arrangement and it worked well when the time came.

On the 18th of May, Mangala went into the hospital for the removal of the stitch. It was expected that the baby would arrive anytime after this was done and so we were on a ‘red alert’. But still we carried on our normal routine. For example, we had a visit from Yash Pal of TIFR, for lunch and he gave us several useful tips on life in the TIFR housing colony, which we were to become part of in October. On May 17, I presented Mangala with a Tissot watch, mentioning that it would be only a few days older than our forthcoming child. On the 20th of May I took the ‘risk’ of going for a feast in Fitzwilliam. This was to be my last occasion to dine in my old college before returning to India and so I did not want to miss out. We arranged for Mrs Sebley to come and sit with Mangala, just in case. If Mangala needed to rush to the hospital, she would call an ambulance and go, while Mrs Sebley did babysitting for Geeta till I returned. In the end nothing happened.,

The next night, however, Mangala began to experience labour pain and we called an ambulance. It came in 20 minutes and took Mangala to the Maternity Hospital. I stayed at home with Geeta. At six in the morning I called to find out how Mangala was doing and was informed that the baby girl had arrived at 4.03 a.m.; that both were doing well. So with a light heart I got Geeta ready as soon as she woke up and we made our way to the hospital. Mrs Abhyankar (senior) agreed to come by Saturday, three days later. This was just as well, for, the hospital had a large number of babies to deal with and so they sent Mangala home in four days.

However, we found ourselves more relaxed in bringing up Girija than we had been at a similar stage with Geeta. This may well be a general experience that parents are more tense bringing up their first child than their subsequent ones. Perhaps the children notice it too in their subtle way! Perhaps they sense the tenseness of a parent and feel insecure themselves. One good thing with Girija that we noticed was her tendency to sleep for longer intervals. We also noticed that Geeta reacted positively to having a younger sister; only we had to occasionally protect the baby from her aggressively affectionate sister.

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I had planned to attend a summer school in Erice, Sicily, in late June/early July. This was agreed to on the understanding that Mangala would be able to manage her new baby without my help. This was asking a lot, but with Mrs Abhyankar offering to come down again and staying with Mangala and the girls, I felt reassured. I went to London to bring her to Cambridge.

The Erice school was very enjoyable and there were several persons there whom I knew well, like Sandage, Wheeler, Arp, Hoyle, the Burbidges, Yuval Nei'man,, etc. Many of the students were very bright and asked intelligent and often searching questions. I lectured on the Wheeler-Feynman theory and our work on it. The lectures were well received.

Fred and I had decided to write up our work in this field as a book which was to be published by the well known publishers W.H. Freeman and Company of San Francisco. Fred gave me at Erice his manuscript and I was to write mine based on his part. I packed it in my suitcase since it was rather heavy to carry around. When I landed back in London, my bag failed to show up. I recorded my address and other details with Alitalia airlines and they promised to send it to Cambridge.

I waited anxiously for a couple of days, before the bag turned up. The lock of the bag was tampered and it came in unlocked state. The electric shaver was missing. I was, however, much relieved to find that Fred's manuscript was intact. Those were days when one wrote manuscripts by hand and there were no 'back up files' in case of a loss. The book saw the light of the day in 1974 and was widely acclaimed.

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With the arrival of Girija, we were more conscious of our impending transition to India. As a first step, in the spring of 1972, we put our house on the market and were pleasantly surprised at the appreciation in its value. In fact the house prices had started rising dramatically over the previous year or so. As the prices were rising every week, our estate agent advised us to wait till the latest time we could afford to delay selling our house. We decided on September 5 to be the hand-over date to the buyer, this date being the same as when I had first left the shores of India in 1957 for my English adventure. Allowing some two months for the completion of legal formalities, we decided to wait till late June / early July to freeze the price. Ultimately, we sold the house at £10,800, nearly double the value at which we had bought it! Had we waited for a couple of months more, we might have improved on this figure by another £1,000 or so. However, we drew the line as required by our time table. I was very thankful to Mangala for persuading me to take the step of buying a house instead of renting it. In the latter option, we would have ended up paying a larger rent than we paid as our monthly mortgage on the loan, got no tax benefit for it and would not have got any cash at the end of the period.

Before parting with the house on September 5, we had to arrange for disposing of the furniture we did not need and packing the rest of our household effects for despatch to India. We had Pickfords to do the latter, while for the former we advertised in the local shops and managed to find clients for the various items. It was often painful giving away an item with which we had close and happy associations. One learns to be detached from one's possessions on such occasions. One such occasion was when I sold our Hillman Imp which had served us so well for six years.

Before leaving Cambridge we had arranged a reception at King's for our friends, to say good bye. It was very well attended and I carry a very happy and poignant memory of the occasion. Mangala had known them since 1966, but for me many had links dating back fifteen years.

We had planned to return to India by a British Airways flight departing on September 8. Where would we stay for the three days after we had handed possession of our house? We did not want to trouble Chandra and Priya, because Priya was expecting a baby soon. Here our friends Meena and Madan Bagga were very forthcoming. Mangala had met Meena when the latter had called as a sales agent for a cosmetic firm. They got to know each other well and Meena's son Sanjeev was more or less Geeta's age. They did not live very far from us and they offered to put us up in their spare bedroom.

So on September eight, early morning we all got ready with our bags and Chandra turned up with his Ford Escort to take us to the airport. We stopped by in Barton to say good bye to Priya. We would meet again, surely in India and in the UK, but it won't be the same as meeting almost daily as two young families sharing many common experiences.

As we headed for Heathrow, I recalled my visit to the Ballard Pier Mole Station, as a raw young lad leaving his country and his family for an educational adventure lasting at least three years. The three years had stretched to fifteen and now many thought that my returning to a changed India was another adventure.

I looked at Geeta on the way to dozing, Giriya fast asleep and Mangala contemplating...

Yes, the Native was finally returning home.

## BOMBAY



At the entrance to TIFR with Professor Chandrasekhar.



## BACK TO THE NEST

SEPTEMBER 8, 1972. The British Airways plane from Heathrow was full, but because we had a baby with us apart from a two-year old, we were given the first row of the central column of four seats, with the facility of strapping the baby's carry-cot to the wall in front. I was expecting that we would get three of the four central seats; but this did not happen. One seat was given across the aisle. I recall being upset at this especially since we had checked in well ahead of time for ensuring good seats. When I complained, the stewardess patiently explained that the plane was full and they were expecting another couple with a baby for whom the other two seats in the central section were required. This turned out to be a fact and also a valid reason for the allocation of seats. I was, however, slightly unhappy that Mangala had to manage both kids with myself being slightly away across the aisle. As it turned out both Geeta and Girija travelled well and we did not have any crisis during the flight.

On arrival, I had to get from the customs the certificate for 'Transfer of Residence (TR)' which would enable us to clear our household effects without having to pay duty. These effects were to come by sea during the next 3-4 months. The TR certificate was soon got but I had to give an undertaking that I would be residing in India for a minimum period of one year from the date of arrival. I gave such an undertaking, although it was to land me in a minor difficulty a year later.

The Rajwades were there to receive us and we made our way to their residence on Ambedkar Road. We were to leave for Pune for 2-3 weeks before I returned at the end of September to join TIFR as a staff member. Formally

my appointment in Cambridge would be until that date. We were amused at the difference in the level of activity shown by Girija and her cousin Rahul Ganu, son of Mangala's sister Meena. Rahul was about a month older than Girija but considerably more active. This difference continued and a few months later, we saw Girija seated placidly in one place while Rahul crawled around her.

I paid a visit to TIFR soon after arrival to meet some of my future colleagues and also to take a look at the 2-bedroom flat in the TIFR housing colony, which had been assigned to us. It was then occupied by Dr Dayanand Verma, a mathematician, who also happened to be a former student of my father. At an area of 1200 sq. feet, it was a biggish flat by Bombay standard. But I had some misgivings as to whether it would be adequate when my parents moved in with us the following year. Goku Menon, the Institute Director, had promised a bigger (3-bedroom) flat once a complex of such flats was completed. I was told that planning work on the complex was going on. I recall meeting Mahendra Singh Vardya (astrophysicist) and Bhalachandra Udgaonkar (particle physicist) as well as Roy Daniel who was the Physics Dean. I was very happy with the friendly reception given to me.

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Like the Rajwades, my parents were also eagerly awaiting all of us especially the granddaughters. We had a royal reception and the spaciousness of the Pune house and the calm ambience were a striking contrast to the hustle and bustle of Dadar. We suspended the 'Tsu-tsu', a well-protected cloth seat hung from the ceiling like a swing, that had carried me as a toddler. Geeta enjoyed swinging in it. Our stay in Poona was comfortable and uneventful except for an amusing event involving Geeta.

During our visit, we were invited to see the telescope on the roof of the Physics Department of Poona University which the then Head, Professor M.W. Chiplunkar had got inaugurated by me a few years earlier. There were some stars or planets that could be seen in almost zenith direction, and to see them one had to lie on the ground on one's back and look through the almost vertical telescope. Professor Chiplunkar demonstrated how to view these objects. The next day at around 11 in the morning, Mangala and I were surprised (and a little shocked) to see Geeta lying on her back on the front doorstep with a small stick held near her eye and pointed to the sky. "I am looking through the telescope", she explained!

My parents were as usual enjoying their evening rides in their car in the environs of Pune city and we were also part of these trips. Unlike the last occasion, when she was less than a year old, Geeta enjoyed these outings. We were also teaching her some simple shlokas to recite. My mother who had worked so hard on us, Anant and I, now turned her attention on to Geeta. Thanks to her patient training both Geeta and Girija were able to recite some well known shlokas.

The house of Vasantmama and his family was another place for us to go to. Both Snehal and Aparna were delighted to pamper their young nieces. The Chitales, the family of Mangala's maternal uncle were also very excited to see these additions to the clan. Mangala's grand mother 'Mothi Aai' was even driven to writing poetry to welcome them.

Thus, our September-sojourn in Pune drew to a close with a nice bit of relaxation before I took on my new responsibilities at TIFR. A long stay in the West accustoms one to take certain things for granted, things that may be quite hard to come by in India. So, more than any problems relating to my employment, I was now to face issues relating to day-to-day living in Bombay.

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The major issue facing a Bombayite, that of commuting to place of work, was non-existent for me since I had been given a flat in the institute's housing colony. My commuting time, door to door from my flat to office was seven minutes, if the lifts to the fourth floor of the institute did not get stuck in a traffic jam. The TIFR colony was rapidly becoming part of a bigger establishment, that of the Indian Navy, which was building a large colony for its staff. So there were shops dealing with day-to-day necessities and Mangala soon learnt how to navigate through them. But the bigger problems remained: that of getting a gas connection, a telephone line and increasing the electricity quota.

Vasantmama, as usual was full of practical information on what to do and how to get some things done. For example, he mentioned that it would be necessary for me to acquire a gas cylinder for cooking in our flat in Bombay. These were in short supply with a long waiting list stretching to several years between application and acquisition of a gas connection. (As an emergency measure we had borrowed one of the cylinders from the Rajwades.) Vasantmama offered to write to Mr Patwardhan, the CEO of Burma Shell which supplied gas in cylinders under the name of 'Burshane'. Vasantmama knew him from Cambridge days and thought that writing to him would enhance my chances

of getting a cylinder. He did so: only to receive a polite regret letter from Mr Patwardhan, who rightly said that as this was a sensitive issue, he could not use his ‘discretion’ to advance me up the queue. I admire him for this rectitude although it did not solve my problem.

It is perhaps a commentary on how our society functions under scarcity conditions. Sometimes writing to the top man for special favours is counter-productive, since his attitude and behaviour are under constant scrutiny. A better result can sometimes be achieved by appealing to someone lower down the scale closer to the actual distribution system. In my case I was reluctant to approach anyone in the permit-raj for a gas cylinder, although if asked, how else will you have cooking done in your house, I would have no answer. For, because of poor monsoon, the power situation in the state was miserable and BEST, the electric supply company for metropolitan Bombay, had severely rationed each household to specific number of units per month, largely based on the previous usage pattern of its residence. This rule had placed me in special difficulty, since my predecessor in the flat, Dayanand Verma had been a very frugal user of electricity and as a result I had inherited a very low quota from him. Thus far from extending use of electricity for cooking, I was hard pressed to accommodate the usage of my household gadgets now on their way from Cambridge to Bombay. I will return to this problem and how it was solved after I have described the gas episode.

One fine morning, I had a visit from the local dealer of Burshane in Navy Nagar, where the TIFR and its housing colony is situated. He had come to enrol me as a customer, since he had received clearance for my application. I was totally taken aback, since after Mr Patwardhan’s negative reply I had felt that we had reached a dead end. It appears that Mangala’s uncle, Mr Rajwade had independently, and unknown to me, requested a friend of his in the Burshane hierarchy to give me priority, given that I had returned from a long stay abroad, and that too at the invitation of the Prime Minister. His friend readily agreed and here was a gas connection!

Regarding electricity, I mentioned to the TIFR Registrar, N.R. Puthran, the problem of my very limited quota of electricity. While I was managing all right in October, the problem would intensify when my household effects arrived and later when my parents moved in to live with us. He discussed the problem with the BEST officials and was pleasantly surprised to discover that the Engineer concerned had been trained in the BHU College of Engineering and had great admiration for my father. He had a discussion with me to learn about my projected needs and made a realistic enhancement in my monthly quota.

With gas and electricity dealt with in this way, my next problem was telephone, and here the matter was more difficult. Puthran said that although I was entitled to an official telephone at my residence, the number of telephone lines allotted to TIFR were limited and committed. However, if I tried on my own to get a line, he would place all the institutional backing behind my request.

The difficulty of this problem was brought home to me when after making a formal application, I enquired with the General Manager of Bombay Telephones about the time scale of getting a line. He told me that there was a severe shortage of lines and that normal waiting period for my case would be five years! This came as something of a shock, since being accustomed to 'same day telephone' or at worst 'telephone within a week' in the USA or the UK, I was prepared for a wait of 3-4 months. But five years without a telephone was unimaginable.

Just then, I heard from a friend that Yashwantrao Chavan, the then cabinet minister in the central government had been enquiring about me to find out if I had been experiencing any settling-down problems. I took this as an opportunity to write to him an informal letter, in which I stated that, but for the telephone, I seemed to have mastered all problems of settling down. He wrote to me stating that he had spoken about my problem to Bahugunaji, the minister in charge of communications. Within a few days I received a phone call from Bombay Telephones stating that a line had been sanctioned, and the company was under instructions to get it installed in my residence the same day. So the same day phone worked in India too, if you happen to belong to the privileged set.

A lot has been said about scarcities, by persons far more experts in commenting and analysing the issue than I happen to be. To me a simple minded picture that was emerging in 1972, was like this. The war for liberation of Bangladesh had severely taxed the National Exchaquer and resources were in short supply. The failed monsoon, always a bane under the best of circumstances, made matters worse. At the same time many scarcities had been created by bad planning and the permit raj. It would take India nearly twenty years to get out of that syndrome. Looking back one feels that many of the scarcities and hardships could have been avoided.

When I flew to Bangalore for a scientific visit, I was advised by several of my friends and colleagues to bring some rice from there, since there was a scarcity of rice in Maharashtra. There was a quota fixed on how much rice could be 'imported' this way. For, there was a ban on movement of commodities

across state borders. Shortly after we settled in Bombay, Mangala's aunt advised buying and storing wheat since it was expected to be scarce and shoot up in price. One of the topics on which Puthran chatted with me in the TIFR Faculty Lounge was how fast the cooking oil prices were rising.

There was another essential commodity: milk! This was before the White Revolution hit Maharashtra. Milk was becoming a scarce commodity. I was initially spared the task of acquiring a 'Milk card' which every resident of Mumbai was required to possess. Based on the entitlement on the card the recipient could collect the specified number of bottles of milk from the local milk booth. These booths were ubiquitous, but where was the milk? Because of dry season, the Government announced a drastic reduction of milk quota. So far as the residents of our apartment building were concerned, the entire building of 99 flats had a predetermined quota, and so I did not need to acquire a milk card. But now with the new directive, I was advised to acquire one. This, again was not easy, but through mutual friends, I got access to the official who issued new milk cards. I got one without delay.

However, the milk allotment of our apartment building was now threatened with drastic reduction. The Management Committee of TIFR housing colony requested me to intercede with the Government of Maharashtra (GOM) on behalf of all residents. I did not possess any locus-standi: in fact I felt that issues like these should properly be handled by the director of the institute. In this case, as in many others, I was to discover that the Director had taken on so many outside responsibilities that he was hardly to be found in the institute premises. With a colleague therefore I set out for the corridors of power, the 'sachivalaya, or the secretariat, which later acquired the name of 'mantralaya'. The colleague in question was none other than Kumar Chitre, my fellow student at Cambridge. After several years our paths were crossing again, as he too had joined TIFR.

Our original intention was to see the Secretary in charge of the department that had issued orders curtailing milk quotas. When we reached his office, we were told that he was away in a meeting and would be back in half an hour. Since we had barged in without an appointment, we were prepared to wait for the period. We informed the Secretary's office that we would be back in half an hour. We took a walk in the corridor, which was full of people with various items of business to see the relevant authorities, as we were. I wondered, how many of those present would get their work done. We were not sure of any success ourselves, as the Secretary was known to be strict. Nevertheless, as we were passing a largish office, Kumar Chitre said: "Why don't we try here?"

The office was that of the Minister Mr Deotale who was the minister of the department whose secretary we were trying to meet. After all, we did not stand to lose much by trying our luck here. So we walked in.

To my surprise, the assistant to the Minister had heard of my name and was very helpful. He went in, had a talk with the Minister and then ushered us in. The Minister was very friendly and seemed to be aware of my history. Chitre and I presented our appeal addressed to the Government. He went through the letter and sought clarifications of our reasons for keeping our existing quota intact. Our clarifications seemed to convince him, for he wrote on the application a note of approval and called the assistant to stamp it with a GR (Government Resolution). The Minister possessed the authority to issue the GR. He asked us to get this order followed up by the authorities dealing with milk delivery, and to get back to him if there were any problem. Our work was done and we did not need to see the Secretary!

To someone coming from an advanced country, it may seem a drain on one's energy and time in dealing with matters that should not normally matter. In the India of 1972 they did matter. To a scientist returning to settle in India after a longish career in the West, these are the things that mattered. There were other things too, which I will come to later. These are to deal with life outside the labs: there are extra issues relating to the labs which also I will mention later in their proper context. Before taking a decision to return to one's motherland, a scientist should have been aware of such issues. Those who felt that it was 'roses roses all the way' would be in for a shock and some would return back to where they came from. But despite these headaches, the persons I disliked most were those who 'wisely' shook their heads and said that the country was going down the drain and that my decision to return after a successful sojourn abroad was ill thought out. If a non-resident Indian (NRI) is planning to return home with intentions of contributing his or her mite to the development of our country, our attitude towards this step should be positive and helpful rather than off-putting.

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My joining TIFR was free from these hassles of day-to-day living. Homi Bhabha had set up this institute as an ideal autonomous research institute in which the bureaucrats played a supporting role to the scientists. A contrast with the universities is seen readily by the example of the post of registrar. The university registrar is a 'big boss' second only to the Vice-Chancellor. Senior professors of

the university have to approach him for administrative decisions that facilitate their work. In TIFR, the registrar plays a self-effacing role and is to be relied on to help scientists pursue their work. In an academic conference in a university, the organizing professor would be committing a grave mistake if he fails to invite the registrar and provide him with a position on the dais. In TIFR, the registrar may not even be invited and if he is, he does not have any special role to play.

I have taken the example of the registrar since he is the head of all administration. The spirit percolates down all the way. I was thus spared any running round from desk to desk, signing this form or producing that certificate. I simply signed a one line joining report. Of course, I had the opportunity of meeting Director Gokul Menon who provided a warm welcome and expressed his vision of growing the then small group of astrophysicists into a world class group under my charge. The group then consisted of Vardya, Chitre , Krishna Swamy, Ramadurai and Tarafdar. I was given an office on the fourth floor with a neighbouring office for Joseph, who had also joined as the administrative assistant to run the group's administration besides helping me with my secretarial needs. The window from my office commanded a stunning view of the Arabian Sea.

Besides creating the TIFR as an ideal working institute, Bhabha had ensured that there would be excellent working conditions. The entire building was centrally air conditioned, which was probably one of the first such big buildings in Bombay. It had two canteens. The west canteen, located on the western side was generally patronized by the academics and had some food items with western flavour. The east canteen was in the east, with purely Indian food. The library also commanded view of the Arabian Sea and was known to house a very comprehensive collection of science books and journals pertaining to the subjects covered by the Institute. The Institute also boasted a state of the art computer at the time I had joined. It also had academics specialized in computer science.

At that time the subject areas of the institute were grouped in two schools: the school of mathematics and the school of physics. The latter also included molecular biology and computer science. The faculties of these subjects were officially composed of associate, full and senior professors. These bodies were delegated the jobs of day-to-day running of the schools. Whenever present, the Director chaired the meeting of the physics faculty; otherwise the Dean of physics took the chair. The mathematics faculty was chaired by the mathematics Dean. I belonged to the physics faculty and recall that at the time of my

joining the strength of the faculty was less than 20. The physics faculty met on a Wednesday and the meeting was followed by a formal lunch in the faculty lounge. The faculty lunches were held every Wednesday even if there was no meeting.

In the theoretical astrophysics (shortened to TAP) group we had informal journal club meetings every Tuesday afternoon and there were astronomy seminars on Thursdays wherein the cosmic ray people also participated. TIFR in fact had a long tradition of cosmic ray research which was then branching out into solar physics, x-ray and infrared astronomy. Daniel was in charge of infrared, Sreekantan in charge of X-rays, Biswas in charge of solar cosmic rays, etc.

Goku had suggested my giving a course of lectures on the theory of relativity, which I was only too happy to give. There were students in the graduate school as well as some interested staff members who attended my course. Two of the students in the graduate school later became my research students, Prashanta Das and Ajit Kembhavi.

TIFR had a fairly rigorous system of interviews for selecting students for research scholarships in the graduate school. A couple of years before I joined, the Institute had changed over from its earlier practice of selecting out of those who had passed the training school of the Department of Atomic Energy (DAE). It had instituted its own advertisements to attract students. The aspiring candidates were shortlisted and some 100-150 were called for interviews. There were several committees to interview these candidates. Each committee was asked to shortlist and send maybe 2-3 candidates for a second interview. A different apex committee interviewed all these shortlisted 20-25 candidates over a period of two days. The marks given by the first committee as well as those by the second committee would count in ranking the students. Eventually from an initial set of 500 or so applicants, 10-12 would be chosen to cover all branches of physics except biology. The biologists had their own interviews and so did the mathematicians.

These interviews usually took place in July and so I had missed those who were attending my lectures. But I found them a very intelligent lot, comparable to the top-level students I had met in Cambridge. It was a pleasure to lecture to them. I recall giving them a final test as a take-home paper to be solved in 168 hours. The idea was that they could consult books if they wished, but not each other or any other person for that matter. The riders given were such that they could be solved only if one had understood the course-work well.

Apart from the coursees, the weekly seminars and journal club discussions there was the wednesday colloquium usually delivered by a scientist in TIFR who had something to report on work done by self or in his / her field of work. In general the colloquia were well presented and deserved better audiences than they got, despite a good tea afterwards! I also felt that there should have been a larger component of colloquia delivered by outsiders. [I recalled delivering a colloquium in 1965.]

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The building where we were staying was across the Homi Bhabha Road, hardly a stone's throw from the Institute. This was the first building to be built, and Goku told me once that the final clearance for going ahead with the plan was signed by Homi Bhabha the day before he flew out to Geneva where he was most tragically killed in a plane crash. Staff quarters had, unfortunately, been on low priority with Bhabha who was more interested in setting up a world class science institute. He, therefore, delayed the plans for having a staff colony next to the Institute. He had tried to manage by renting apartments in Bombay and also using a small fraction (I think 10%) of the accommodation that DAE had built. These were at best a makeshift arrangement and hardly offered a conducive state of living for the scientists he was trying to attract.

With this background, the B-1 Block was the first building to be built in the area assigned to the housing colony. It had 99 flats, 100 if we count the Director's flat as two; with ten floors of 10 flats each. The end flats were larger although all were two-bedroom ones. I was given flat 201 with a promise to be moved 'up' to a similar flat at a higher level when it fell vacant. At levels higher than 6 one got a beautiful view of the sea and also refreshing if strong breeze. The residents had formed an informal society called COBRA, short for Colaba B1-block Residents' Asociation. It dealt with the overall maintenance problems and more importantly with the milk distribution system. It had employed a Keralite, one Pillai, who supervised the milk delivery to the flats. Thus we had the luxury of milk being delivered to the doorstep.

We had soon made friends with various occupants and were relieved to find that there were kids of 2-3 years age-group, with whom Geeta could play. Thus she made friends with Manisha Pitke, Rekha Vardya, Deepali Damle and Pradnya Devare, who all continue to be in close touch even today. This was a great advantage of the COBRA community: it was large enough for one in any age group to develop good personal contacts.

Getting a maid for cleaning was also no problem. The slum area dignified by the name Geetanagar, was close by and cleaning women were only too keen to find jobs in the COBRA system. Likewise, Mangala found grocery and other shops as well as vegetable stalls in walking distance.

When we moved in, we had hardly any furniture and household gadgets. We got some beds made and borrowed some gadgets. But we eagerly awaited our personal effects that were to arrive from England. We were very happy when in the third week of January, we received notice from Lee and Muirhead, the local agent of Pickfords in Cambridge, who had packed the stuff and sent it. The stuff had arrived and was to be cleared through customs. I was asked to come to the docks with the relevant documents. The process took one whole morning, but by the end of the day the truck containing all our furniture, gadgets, clothes, books, etc., finally arrived. Geeta, in particular, recognized her Cambridge toys and was excited to be reunited with them. Our flat which had looked very bare till then suddenly looked very crowded! But thanks to all the local help we had at our command, we had no problems. In Cambridge, we had managed the dispatch through Pickfords with just the two of us doing the running around.

I should mention that it was in October, shortly after we arrived in B-1 Block that, Bombay had a TV channel. The Doordarshan started a local channel, but no one in our neighbourhood had a TV! Perhaps very few in Bombay had sets to watch the programmes. For, as usual there was scarcity and one had to book, face a waiting list, etc. In our case, however, we had bought a Pye set in Cambridge for the Indian Pal system and this set arrived by a different ship (- it was sent separately) in November, 1972 and so for a time, we were alone in having a TV set in our entire housing colony. On some days, we could also catch bits of transmission from Pakistan TV beamed from Karachi.

Thus a major transition in my life was achieved with comparatively small hassle and at least workwise, I did not feel any disruption. I of course missed the constant flux of astronomers that the IOTA was known for. However, I had the assurance that I could travel abroad for any working collaborations since the TIFR had fairly liberal leave rules. Our daughters were fortunately too small to have experienced any ‘culture shock’ and got adapted to the new environment well. Thus by March 1973, we felt settled enough to welcome my parents whenever they felt like winding their establishment in Pune and moving in with us.

## LESSONS IN CO-EXISTENCE

IT had been understood that my parents would come to live with us after my father retired from active service. This had been one of the reasons why I had decided to return to India in 1972. My father was the Lokamanya Tilak Professor of Applied Mathematics and Astronomy in Pune. His tenure of appointment would run up to the end of September, 1973, the month in which he turned 65. We had arranged for my parents to come and live with us in Mumbai afterwards.

As the retirement date approached, my parents had to worry about reducing their accumulated household effects to bare minimum since they would have only one room in our two-bedroom flat in Colaba. This was a difficult decision for both. My father gave away a lot of books to libraries and individuals, books he had cherished as treasures. My mother had accumulated a number of household items, knick-knacks from our childhood days, including our toys, clothing items, etc. It was hard for her to give them away. Although she used to quote the Sanskrit saying “One should live in one’s house as if one were a guest there”, she found it harder to shed attachment to the house and belongings than my father.

Nevertheless, the shortlisted items were finally loaded onto the truck to Bombay. I recall there was some tension as the truck did not arrive at the promised time and anxious phone calls had to be made to ascertain that it was on the way. It finally did arrive a couple of hours late. After loading the same, we could lock the empty house and hand over the keys to the Estate Department of Poona University.

The moving-in operation was not so difficult at the other end and my parents soon settled in. Our flat which had looked so roomy and large a year earlier now looked full and not so large. I was, of course, still hopeful that Goku Menon's promise to let me have a larger three or four bedroom flat within a year or so of joining would soon translate into reality. We had arranged for Geeta (and later Girija also) to share bedroom with my parents as its size was quite large. In fact it could have been possible to have three bedrooms of a smaller size accommodated within the area of the flat.

My father soon established his routine according to which he would spend two hours in the TIFR library, where his daily visit became quite well known, including the chair that he would occupy. The library staff came to know of his interests and would bring to his attention any new additions in those areas. He, in turn, would recommend new books or periodicals for addition to the library.

My mother helped Mangala in household chores, especially cooking, wherever needed. Thus Mangala, ever interested in learning new dishes from far and near, added to her repertoire North Indian dishes that Tai had learnt in her 23-year sojourn in Banaras. One of the two part time housemaids helped in cutting vegetables and washing dishes.

But Tai's most valuable contribution was in teaching Geeta and Girija Sanskrit shlokas to recite, just as she had taught Anant and me when we were kids. Geeta originally called her 'Tai-ajji'. But she did not like the suffix 'ajji' presumably because it had associations in her mind with old age! So Geeta changed it to 'Taji' which she came to like since the word meant 'fresh'. The conversations Geeta and Girija had with Taji and Ajoba, including recitals of shlokas, before going to bed, remain some of the happiest memories in my life.

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After a gap of several years, I am able to think dispassionately about the value of grandparents sharing the household, as used to be the case under the traditional joint-family system in India. Certainly there are advantages and disadvantages, and one can do one's evaluation depending on one's own specific example.

As they say, when pots are packed closely they are bound to bang against one another. So there is difference between grandparents visiting for a few days in the year and having them share the household with you. In the latter case there are bound to be clashes. For example, no two housewives run the

house in the same way. With Mangala and Tai, there were occasional differences of opinion on various day to day matters which in retrospect may seem trivial, but which at the time may have caused heartburn to either of them. With her North Indian experience, Tai was more used to the servants being ‘servile’, and this led to some clashes with the more independent minded Bombay maids. On such occasions Mangala had to act as mediator. This led Tai to think that Mangala was pampering the servants.

My father was a stickler to time and followed a daily routine very much as per his pre-set clock. He would not compromise with his schedule, even if it sometimes led to problems for guests and visitors. I once recall, I had invited several students and some foreign professors to tea. My father was also present. After his ‘time limit’ for the tea was over, he got up, said ‘bye’ to everyone present and left for his room. The others thought that this was signal for them all to leave! I had some problem persuading them to stay on and continue their chat.

In any case, our ideas on running the house and theirs were not expected to match with the gap of a generation and with the different perspectives Mangala and I had acquired after having spent years abroad. So there were matters of disagreement. I must salute Mangala for navigating her way through occasional troubled waters for nearly 24 years.

However, as a cultured couple with a long experience of human diversity, my parents were a great asset to have around our growing children. They were wonderful with children, not interfering with their discipline, but keeping them amused with stories and games. They, of course, were the natural babysitters whenever Mangala and I were invited out to dinner or went to some late show.

There were occasions, fortunately not very often, when I experienced great stress and then my father was a good soothing experience. There were occasions too when I disagreed with him. All along in his life he had been accustomed to people around him agreeing with everything he said and so he found such occasions of conflict very distressing. On many such occasions I used to wonder why despite reading and preaching deep philosophical thoughts and the merits of ‘non-attachment’ to worldly goods, he would be disturbed by some petty thing or other.

There was likewise a trait in Tai that Mangala and I were amused to notice. Whenever I brought a gift like a sari for Mangala, Tai also would expect one and so I began to bring two of the same. Even there, Tai would expect to be the first one to choose! We rationalized this trait as a reaction

coming from years of suppressed desires for such items since my father never encouraged buying items of dress or jewelry considering them avoidable luxuries.

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Since returning to India, I had ample occasions to visit abroad, mainly the U.K. and the U.S.A. for my research collaborations. Almost every year I would be away for a few weeks or so. On somewhat longer trips, I took Mangala and the girls also. Thus these 'family' visits abroad were in 1975, 1977, 1979, 1980-81, 1984 and 1988. By the time of the last two visits we had the addition of Leelavati to the family. I will have something to say on these visits in the next chapter.

During such visits, my parents would continue staying in our flat by themselves. Fortunately there were several of my colleagues and neighbours around who knew them well and could be relied upon to help in case of necessity. However, in 1975, when I was planning a visit to the USA, Tai expressed a strong desire that we should take both her and Tatyasaheb (my father) with us. Fortunately the grant I was getting was just sufficient to cover all the fares of my extended family and I started the operations for visa for the U.S.A. for them. Since they had not travelled abroad since 1963, my parents needed new passports, which also we got for them.

However, at this stage my father developed cold feet! We were planning our trip from the East Coast covering Washington D.C. and New York where we had family friends like Yashoda Dilwali and Rajan Devadas who would have been happy to meet and host my parents. After a week to ten days in the East we were to move to Southern California. Now my father looked up the temperatures of New York and Washington in winter and felt that he would not be able to stand the cold. Tai would also have the same problem, although the attraction of a foreign trip weighed more with her. We also explained that houses are warm despite cold weather outside and that they would move everywhere in heated cars. Yet, my father's anxiety continued to the extent that we cancelled the visit of my parents.

However, I hoped that they would manage to come with us if we visited warmer parts of the United States on a later occasion. Such an opportunity presented itself in 1977 when I was invited by John Wheeler to visit the University of Texas at Austin. On that occasion, I had a four-month visit scheduled, from the beginning of March to the end of June. I had arranged for Mangala and the girls to join me in early May for the second half of my visit.

I offered my parents the possibility of joining us on that occasion. I expected the East Coast to be reasonably warm in early May, and Texas, of course would be much warmer. This idea did materialize and Mangala was landed with the responsibility not only of bringing two girls of 5 and 7, but also shepherding senior citizens of 64 and 68. I must say that she managed the job very well.

Our first stop was in New York. I had flown from Austin to meet the arrival of Mangala with her entourage. Yashoda Dilwali, with whom we were all to stay had managed to get a neighbour to make sleeping arrangements for Mangala, myself and the girls, while my parents were to stay in her apartment. This worked well. Although we were together in New York to start with, I had arranged to divide our group to make it easy for our hosts. So my parents stayed 3-4 days longer in New York after we four left for Washington, D.C., to visit the Devadases. By the time my parents followed us there, we had nearly completed our stay in the Devadas house. We had only a day's overlap there.

Although we had planned to be in New York in May, expecting it to be warm, the weather turned out to be quite fickle. It was reasonably warm when my parents landed there and continued to be so for a couple of days. Then some cold front from the North hit the town and mercury dropped. In fact there was a brief period one day when it actually snowed. In a way, it was a novelty for my mother since she had not seen snowfall till then and had not expected to see it on this trip. However, when they stepped out, they found the cold weather quite unbearable. And with that experience their sense of insecurity returned!

One incident that showed their nervousness, occurred while Yashoda was away on her work and these two were the sole occupants of the house. Although they had the house key and could take a walk out, they were too scared by the cold outside, to venture out. During this time Yashoda asked a young friend of hers to look in and make sure that my parents were OK and also to see if they needed anything. This young man knocked at the door. My parents had read a lot about unsavoury characters forcing their way into apartments and mugging those inside. So they opened the door only to the extent of the small gap allowed by the door-chain. The young man explained that he had been sent by Mrs Dilwali to enquire after them. So they let him in and he had a short chat with them. He was nice and polite and offered help if any was needed. My parents thanked him and he left. However, throughout their conversation, my parents were not sure whether the young man was an imposter who would soon get into the act of mugging.

This incident, when they narrated it for me, illustrated for me the change

brought about in my parents with age and by a sheltered style of living. Till 1973, they had lived by themselves and had controlled the way their life was to run. Since coming to Bombay they began to lose this spirit of self-reliance and were getting more and more dependent on us. I believe, this change comes in all of us with age, but may come more drastically only when we have a style of living dependent on help of others. In the case of my parents they had also got used to the warm weather of Bombay and so found colder weather unbearable, despite their earlier long stays in Banaras and Ajmer where winters are harsher than in Mumbai or Pune.

Despite this limitation, my parents enjoyed their New York sojourn, including the sight-seeing of the landmarks of this great city. Their visit to Washington was even more enjoyable. Rajan Devadas and Kimiko-san looked after them very well. For Rajan, who had been secretary to my father in the early 1950s, my father had been a hero and a model for plain living and high thinking. He had arranged a lecture by my father in the George Washington University, where he could share his thoughts on higher education with the university academics. My father enjoyed giving this talk and so did the listeners who were impressed by his eruditeness. Rajan showed my parents all the important sights of Washington area and they had altogether very good time.

As in New York and Washington, my parents followed us to Austin a few days after we reached there. The weather in Austin was definitely warm enough for the comfort of my parents. However, my father had developed terrible cold and cough while in Washington and took a couple of days to shed them off. This circumstance also brought home to me the potential difficulties faced by older persons travelling abroad. Fortunately, their six weeks stay in Austin passed off without any serious problems and they carried back pleasant memories of their stay in the United States.

During our stay in Austin I rented a car every weekend and took the family for rides to places of interest like the Zilker Park, St Antonio, etc. and also to stores for shopping. With my parents in the car, Geeta and Girija were encouraged to recite aloud their repertoire of Sanskrit shlokas. I have very happy memories of such car rides. In Austin, both John Wheeler and George Sudarshan were very happy to meet and talk to my parents. George, with his knowledge of Sanskrit, also liked to exchange shlokas with my mother.

When our stay in Austin was over we flew back via New York. We had some three hours' wait at JFK and we were pleasantly surprised when both Yashoda Dilwali and the Devadases, Rajanji and Kimiko-san came up to meet us. They also came laden with gifts, including an impressive photo portrait of

my father by Rajanji. The photograph was an enlargement with varnish so cleverly done that it looked like a painting. With all such gifts and our own carry-on bags, our hand baggage ran up to eleven items. When our checked bags were added, some eight suitcases, we were certainly not travelling light. I was reminded of my childhood visits to Kolhapur when we travelled with lot of baggage. Only this time we were travelling by air...fortunately the airline did not object to the many items of hand-baggage.

However, we did find it a problem to collect and carry all the items of baggage at the other end of our trip. The Santa Cruz Airport at Bombay was still functioning from its congested old building and there was hardly any room to carry or transport baggage. The baggage carts were still not in use and we had to set up some kind of relay to move all items of baggage from the arrivals lounge to the vehicle sent by TIFR. Fortunately, it was roomy enough to be able to carry everything including ourselves.

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With their growing ages, my parents always lived under the shadow of illnesses, occasional or chronic. My father was a diabetic and had been so since 1956. He observed great discipline in what he ate and followed any medical advice strictly. Fortunately in Bombay we had the benefit of advice from the great diabetics expert Dr S.S. Ajgaonkar and his son Dr Vijay Ajgaonkar. In fact, we were fortunate in having several leading experts in different medical fields advising us not only as doctors but as family friends. Apart from Dr Ajgaonkar, I may mention Dr Ajit Phadke, Dr Durga Dutt Gaur, Dr V.B. Damle, Dr H.V. Pophale and Dr Sharad Jogalekar.

In spite of his precautions, my father began to notice other problems from 1975 onwards. He began to suffer from high blood pressure and ischemic heart disease. He had to be hospitalized and had to restrict his movements considerably. In 1986, he had a major heart problem and when he was admitted to the Bombay Hospital, our TIFR medical consultant Dr R.V. Jotwani was very worried as to whether he would make it. He did, although his health remained frail. He was advised frequent but short stretches of walking exercise. This led to changes in his routine. He discontinued his visits to the TIFR Library. Also my parents discontinued their evening round of the TIFR west lawn and the seaside walk. This, as usual, used to be a very strictly timed affair and several of my colleagues in the TIFR housing colony mentioned that they missed seeing my parents on their evening walk: some even joked that they

could set their watches by the time of this walk. Fortunately, The Bhaskara building (as the B-1 Block was subsequently named) had long covered corridors just suited to their recommended short walks.

Although they were reasonably fit for their age, my parents, especially my father suffered from a syndrome of insecurity. The reasons for feeling nervous about the future ranged from political situation worsening (e.g., when a state of emergency was declared in 1975) to what will happen to him in case he fell seriously ill while neither I or Mangala were on the spot. In some cases his rationality would prevail and he would reason his way out of whatever was bothering him. On other occasions, Mangala or I would have to sit and reason with him to convince him that his reasons for worry were groundless. I often used to wonder, what it was that changed a far seeing rational intellectual into a nervous individual bothered by imaginary worries. Was it simply old age? Or was it, as I thought more likely, the change brought about by retirement that made him feel that he was no longer in the driver's seat?

Compared to my father, Tai had fewer anxious moments. In fact, I do not recall her having had any serious medical problem. Possibly, her time was spent so much on looking after the needs of my father that she had no occasion to worry about her own health!

Indeed, in retrospect, one agrees more and more with the old adage that old age is like a second childhood. The anxieties, feeling of dependence on others, imagined insecurity of existence, a daily schedule with long gaps of inactivity may bother a retired person just as they may bother a schoolchild. I sometimes feel that had my father engaged himself in some constructive activity (and he was capable of many) instead of just confining himself to reading, he might have escaped these anxieties most of which were not real but imagined. I hope that I will be reasonably occupied with constructive activities when I reach that age.

## VISITS ABROAD

WHEN he set up TIFR, Homi Bhabha had an eye towards the goal of self-sufficiency in science. He hoped to create a scientific infrastructure that was not only made up of scientists of high calibre, but which was also self-sustaining. Thus, in the early years, he encouraged the TIFR students to go abroad for their Ph.D.s and also pick up experience of post-doctoral research. After a decade or so, however, he felt that those Ph.D.s were capable of guiding the new generation of students in India, in Bombay, given all the modern facilities he had created at TIFR. Indeed in the new buildings on the seashore, one felt that one were in a modern research lab somewhere in the west. A typical reaction of a visitor from anywhere in India would be to exclaim: "But this does not feel like India." Of course, such a remark indicated the superb environment of the Institute, far from the madding crowd, away from the humid heat of Bombay, and free from the Babu-raj that governed life elsewhere in the country.

The Founder's primary hopes were that the academic freedom in the institute would encourage good research, and draw talented students. Thus academic staff members were encouraged to have foreign collaborations that required them to visit abroad once in a while. This was like charging batteries of a gadget periodically. He also hoped that most people trained in the institute would go and improve the academic standards of Indian universities by taking up senior professorial posts in the university departments.

In these respects his hopes were only partially fulfilled. Certainly there was no dearth of collaborations with foreign universities in the USA or Europe or Japan...but it was difficult to persuade a staff member to give up his reader's position and take up a senior professorial job in a university. This was because, the Indian university system had been allowed to steadily go down in standards. Even my own *alma mater*, the B.H.U. had become a hotbed of political activity, a victim to casteism, and noted for student indiscipline. The description embodied in its theme song: "Madhur manohar ateev sundar, ye sarva vidya ki rajadhani" (Very pleasant and delightful, this campus is the capital place for all types of education -) had long ceased to be of relevance. The 'sons of the soil' only policy of recruitment that dominated academic selections made it very difficult for someone from outside, howsoever able and distinguished, to be appointed in a senior position. And BHU was really no exception: almost all universities were suffering from the same malaise.

So, while there was no dearth of TIFR academic members going abroad for research collaborations, very few of them could make a permanent transition to a university. Rather, in an ironical twist of circumstances, the transition hoped for by Bhabha took place in the reverse fashion. University academics of good mettle, discovered that their work could not flourish in their universities and managed to find suitable positions in TIFR or other autonomous research centres. This filtering out of good talent reduced the universities to mediocrities even faster.

I had been noticing this deterioration in the university environment during the 1960s, during my various trips to India. For, I kept in touch with the university academics through lectures and correspondence. The decline had in fact started in my graduate years, in the latter half of 1950s. From sporadic developments, it changed to a steady trend in the 1960s and accelerated towards a free fall during the 1970s. While in TIFR, I did my best to encourage those university academics who showed signs of good research productivity to come to TIFR for research visits. However, this was a drop in the ocean, as were my visits to university campuses for lectures and interaction.

As will become clear later in this narrative, I discovered that it would not be possible to have a really effective interaction with the university academics while working at TIFR, and I could acquire some satisfaction of having played a positive role. But that was much later when I moved to Pune to establish IUCAA. As to my own foreign collaborations, during my TIFR sojourn I could continue where I had left off and diversify my activities.

While leaving Cambridge, Fred Hoyle had encouraged me to visit the UK and continue my research collaborations with him. He was no longer in the commanding position of a university professor heading an institute, but he still had his personal prestige in the British astronomical establishment and could arrange for research funds for my visit through the Jodrell Bank Observatory, where he had a good personal rapport with the Founder Director Bernard Lovell. Being himself in the Lake District, it was easy for Fred to maintain good interaction with the Jodrell Bank. So my first visit abroad after joining TIFR took place within a year of my return to India in 1972.

In August 1973, the 13<sup>th</sup> International Cosmic Ray Conference was to take place in Denver and I was one of the large delegation sent by TIFR, which has always been a strong player in the field right from the early days of Homi Bhabha. I chaired a session in the conference as well as presented a paper. However, my main interest in this visit was because it gave me an opportunity of a stop-over in the UK to have discussions with Fred Hoyle. Hoyle had arranged for a grant to cover the cost of my UK visit for a month. So I decided to visit him in Cockley Moor as well as spend some time at the Jodrell Bank on my way back from the ICRC.

I encountered an unexpected problem at the Bombay Airport on my way out! While passing through the customs, the officer-in-charge noted that I had returned to India and availed of the facility of ‘Transfer of Residence (TR)’ less than a year before. At that time I had given an undertaking that I would reside in India continuously for at least a year. Indeed this was not an unduly harsh condition to impose on a returning Indian. For, with that TR facility, I had been granted duty-free entry for all my household effects. Also, while signing the undertaking I had assumed that foreign visits like the one I was going on now, were short enough to be seen as small interruptions not violating the spirit of the ‘continuous residence’ clause. I explained to the officer that I was indeed continuing to reside in India after returning from a short (less than eight-week) academic sojourn. Fortunately, I was able to convince him and he let me leave the country after signing one more undertaking that I was returning within a limited period.

The ICRC was for me a new experience, since I had not expected to find such a large gathering of experts in cosmic rays. Only the IAU General Assembly that I had attended briefly in 1970 was a bigger meet. However, I enjoyed the meeting and the pleasant setting in the University of Denver. On the way back I met the Devadases in the Washington DC area and was happy to find that the family had moved from the rather congested apartment in downtown DC

to a bungalow in the residential area of Rockville, a suburb of Washington, but located in Maryland. I was flying out with the next halt in New York where I met Yashoda Dilwali.

My entry into the UK was through Manchester from where Jodrell Bank was not very far. I was put up in a hotel in Alderley Edge from where I could take a bus that periodically collected staff members and visitors to the Observatory. So I could visit the Observatory without any difficulty. After reaching there, I telephoned Fred and arranged for me to visit him within a few days. He confirmed some bad news I had heard from Geoffrey Burbidge at the ICRC, that 'Gram', (Mrs Clarke, mother of Barbara Hoyle): was ill from terminal cancer. Only the year before, Mangala and I had seen her responding well to surgery in the Evelyn Nursing Home in Cambridge. At that time we had not expected that she would not recover.

As things turned out, when I got down from the train at Penrith and saw Nick Butler who had come to receive me, he broke the news: "Gram died yesterday, we just had the funeral." I was immensely sad to get this news. I recalled how Gram had been extremely kind to me, in particular, letting me drive her to work in her car so that I could get enough driving experience to pass the test. I recalled the delicious scones made by her that I used to enjoy at 1 Clarkson Close. Most of all, I recalled her affection for me.

Nick brought me to the guest house where I was to stay and then took me to see Fred and Barbara. Despite the tragedy in the house, both were very hospitable. Because of the funeral, all the Hoyle and Clarke families had assembled and I could meet them after a gap of more than a year. Elizabeth was there with her two daughters, Samantha and Jacqueline a couple of years older respectively than Geeta and Girija.

Fred was in fine form in the hills of the Lake District. There were many trips I made with him in the car as well as on foot, all over the region. Our discussions ranged all over astrophysics as well as fundamental physics and also about our forthcoming book to be published by Freeman. I was reminded of our earlier visits to this region as well as to Scotland, but I thought that he was never so relaxed at Cambridge, with all its academic intrigues. Although he was now academically isolated, he was more in his element. We did not get any work done that would lead to a paper, but the discussions certainly helped me a lot in my own understanding of the problems we were trying to solve.

During my stay in the Lake District, I used to have a hearty English breakfast in the guest house where I was staying and then walk up the hill to the top where the Hoyle House, Cockley Moor was. It was a 20-minute climb

but very pleasant (if it was not raining!) and also helped in burning some of the extra calories that I had picked up at breakfast.

I returned to Manchester, after a couple of weeks and gave a seminar at the Jodrell Bank. I also got in touch with Chandra Wickramasinghe, who had now moved to Cardiff. In fact, after Fred's departure, there were several changes in his institute with a lot of people leaving. Chandra joined the University College Cardiff (which was basically the university for South Wales) as Professor and Head of the Department of Applied Mathematics and Astronomy. He moved to Cardiff in the summer of 1973 and had bought a house in the select residential area of Lisvane. Chandra was very pleased to learn that I was in the UK and insisted that I should visit him in Cardiff. So I took a train from Manchester to Cardiff and was met by Chandra at the Cardiff Central. It was a very pleasant three days that I spent in Cardiff with exchanges of news at both ends...Cardiff and Bombay. Chandra and Priya were hospitable as usual and their two kids Anil and Kamala (of approximately the same ages as Geeta and Girija) soon made friends with me. It was difficult to believe that we were no longer in the same city, but were separated by continents.

Besides Cardiff I also wanted to visit Cambridge and did so, staying at King's. I was given a guest room and took advantage of my 'M.A.' status to have meals at the High table. I was no longer a Fellow, but could use the combination room and walk across the lawns! I found one major change in the College: there were a few women fellows. The change over to co-residential colleges was taking place in Cambridge with King's taking the initiative; and it would be completed in a couple of years or so. I was able to meet several of the Fellows I knew well and they were very cordial in receiving me.

I paid a brief visit to Hoyle's institute which had changed from IOTA to IOA (Institute of Astronomy dropping the adjective 'Theoretical'). The institute was passing through a transition and had yet to pick up its early momentum. There were very few staff members and visitors. Donald Lynden Bell was in command as Director and was in the process of getting more scientists. Of the earlier staff members, only Sverre Arseth and Peter Eggleton were still there. Hoyle's successor had not yet been appointed, but the chair would shortly be filled by Martin Rees. Although the Institute picked up its early reputation of being a Mecca for astronomers within a year or two, at the time it looked rather quiet and somewhat lifeless.

One of the attractions of visiting Cambridge was to meet my old friends. I could meet the Jeffreys, Lapwoods and the Salts. It was to be a pattern in all my subsequent visits to Cambridge. However, as time went along, their

numbers, as also of the Fellows of King's I knew, dwindled and at the time of writing there are hardly any persons in Cambridge, whom I would like to meet and renew old contacts. It is remarkable, how the image of a city in one's mind is linked with human friendships and associations.

I returned to India a week earlier than planned for a totally unforeseen reason which I will explain next. But as I left the shores of England, I realized that for the first time in sixteen years I was visiting the country as a non-resident needing an 'entry permit'. Although I still felt quite at home in moving around in the country, I kept reminding myself that I was doing so as an alien. The reminder always brought a pang of sadness, since I had many happy memories linked with my stay in the U.K.

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When I was lecturing in the summer school at Erice in Sicily in August 1972, a Fellow lecturer was Yuval Nee'man, the Nobel Laureate from Israel. He extended to me a very cordial invitation to visit Israel any time. "Even if you come without an invitation or a visa, just tell my name at the airport, and they will let you in." he had said. This was relevant since at the time there was no diplomatic link between India and Israel and the Indian passports carried the endorsement that they were not valid for two countries: South Africa and Israel. Moreover, Nee'man's claim was based in fact since he was a very popular figure in his country. He had a brilliant career in the army before turning to physics and getting a Nobel for his work.

In 1973, when I was planning a trip to the USA and Israel, I remembered this invitation and wrote to Nee'man. Very soon I got a warm invitation to visit and lecture in some of the distinguished institutions and universities in Israel. So I explored the possibility of going to Tel Aviv on my way back from the UK. The flights were soon arranged. However, to get a visa from Israel, my existing passport could not be used. Instead I had to apply for a new special passport valid only for Israel and that too for that particular trip only. My application eventually met with success and I had the passport in hand. A visa from Israel was also obtained from an embassy of a country serving as 'third party' since there were no direct diplomatic relations between India and Israel.

Shortly after I was given this passport, I received a visit from an official of the Department of Atomic Energy, which was the controlling department of the Government of India for TIFR. The official interviewed me as to the purpose of my visit to the country and having satisfied himself that it was totally scientific

and with no political implication, he then had one advice to offer: "Sir, please stay away from the media, even if it be for scientific purposes. You never know what your appearance on TV or in a newspaper could be used for." In short, the Government of India wanted to play it safe!

So when I left for the USA and UK in 1973, I was fully prepared for my visit to Israel and was looking forward to it. However, when I was in the UK, the situation in the Middle East, never tranquil at the best of times, began hotting up and I felt increasingly nervous about going ahead with my visit. So one day I dropped into the Air India office and rerouted myself to fly direct from London to Bombay.

This was just as well, since within a week or so there started what became known as the Yom Kippur war. This was initiated by the nations hostile to Israel in the Middle East making a surprise attack on the country when it was busy celebrating its Yom Kippur festival. The war lasted for about a week and ended in a ceasefire when the United Nations Security Council asked for it. The rest is history.

After this abortive visit, I had another chance a year later to visit Israel for the International Conference on General Relativity and Gravitation. The diplomatic situation in 1974, probably as a result of the Yom Kippur War, had hardened. My application for a new special passport for Israel (- the previous one had been surrendered to the Government of India on my return from London -), did not receive any response. As the days of the conference drew near, I grew anxious and asked Gokul Menon for his advice. He promised to enquire in Delhi and did so. He communicated the reply he received 'off the record': that the decision had been taken not to give me the passport I had asked for until the day of the conference was past; however, I will not get a 'No' in writing. The implication was clear. The Government of India did not wish a leading scientist from the country to participate in the international meet hosted by Israel. But, at the same time, it did not wish to take a public stand on the issue as it might be used as propaganda by Israel against India. Moreover, the conference was sponsored by IUPAP (The International Union of Pure and Applied Physics), a part of the International Council of Scientific Unions which had laid down a strict policy for all its adhering member nations that there shall be no visa restrictions preventing participation of scientists. As an adhering nation India could not deny me the passport, but had effectively done so by sitting tight till the time of the meeting was past!

This was my first experience of how diplomats handle problems!

The visit in 1973 to the UK was followed by later visits in 1975, 1976, 1978, 1980-81, 1985, 1986, 1987 and 1988. On some of the longer visits, I was accompanied by Mangala and the family. On each visit, renewing contacts with my Cambridge friends was on high priority as also a visit to the IOA. I also developed contacts with the University College, Cardiff and was happy to meet there, Chandra and Priya and their family and also Fred Hoyle who occasionally visited as an Honorary Fellow of the institution. Indeed during the 1970s, several of Hoyle's earlier associates like Willy Fowler and Don Clayton visited Cardiff and some of the earlier collaboration at Cambridge could continue there in Cardiff.

Except for the visits in 1975 and 1980-81, all these visits were short, not exceeding 4-5 weeks. I recall visiting the UK in the 1976 summer which had a record breaking long spell of dry weather. In a country where rain rather than the sun is the norm, this anomaly led to severe water shortage. I was staying in the faculty guest room in one of the residences of University College, Cardiff and during the emergency period, water was available only for six hours daily. Unlike Indian houses which are equipped with water storage tanks that are filled during the limited hour water supply from the municipal corporation, the British houses have no reserve capacity. So on an emergency basis, water was stored in bath tubs! Amongst the other emergency measures, the direction of the river Thames was reversed. One Hindu organization in Birmingham also performed 'Yajna' to invoke the rain god to be merciful and cause rainfall. Apparently it did rain a few drops but that was not enough! Whatever the atmospheric conditions that eventually caused a rainfall, when it did finally arrive, it was, for once most welcome in England.

Of the longer trips, the one in 1975 was for three months and we visited Cardiff. We had rented for our stay, the house of Dr Humphrey and Mrs Elizabeth Palmer, who were also from the University College. It was in the quiet residential part of Cardiff, called Pant Mawr and was within ten minutes drive from the Wickramasinghe residence. Naturally our families met very often and in some way our interaction was like it had been in Cambridge during 1966-72. Geeta and Girija were too small to be in a proper school and they went to a neighbourhood playgroup.

It was during this visit that I was looking forward to attending a special meeting arranged in Venice to celebrate Fred Hoyle's 60<sup>th</sup> birthday. I was due to speak in the meeting and was hoping to meet several of the colleagues whom I had known since the IOTA days. Both Chandra and I were due to go for this 5-day meeting. However, a couple of weeks before, Anil came down with

mumps. Although it is known to be contagious and we had taken precautions to keep him isolated, I managed to fall victim to it with only a few days to go before the meeting. So I had to cancel my participation at the last minute, much to my disappointment.

The 1980-81 trip was scheduled for one year, again at Cardiff. This time I had a work permit and a senior research fellowship from the Science Research Council of the UK. It was a professorial level visiting appointment. I recall one very valuable advice that I was given by the accounts officer in the bursar's office who was to issue my pay-slips. The question arose as to whether I should opt for deduction of a set amount to be credited for my pension fund or to opt out of the system altogether. My preference was for the latter, as it would have increased my take home pay, whereas, I saw no tangible pensionary benefit from making a contribution just for one year. I explained to the officer that I was earlier part of the universities superannuation scheme when at Cambridge and had encashed all my benefits while leaving for India in 1972. Nevertheless, the officer insisted that I should get back onto the pension scheme since by reversing my 1972 option I could receive the benefit of service for the entire period served at Cambridge. What about the cash I had received in 1972 from the pension scheme, I asked. That would be treated as a long term loan with a 4% annual interest. This would be set off against the cash I would be entitled to at the age of 65. The rough calculations done by the officer convinced me of the wisdom of his recommendation and I opted for the scheme. I have never regretted that decision since today I am enjoying a pension from the UK that far exceeds whatever pension I would have received from India.

This time we had a rented house on the Mysecoid Road in the north of Cardiff, again not far from the Wickramasinghe residence. Geeta and Girija were of school-going age and we needed to send them to a school preferably in our vicinity. Fortunately, the Ton-e-ruin school was very close by and the girls got addmission in classes 3 and 1 as suited to their age. Compared to the difficulties a parent has in getting the child admitted to a school in India. I had no problem here. Indeed I was amused that the School Headmaster sent round a cyclostyled letter to all residents in the area urging them to send their children to his school. The reason was, because of a shrinking population the UK schools were recording below-normal attendance of students and were merged and closed as necessary under the Thatcherite regime. So here the Headmaster pleaded to admit the children even six months below the normal age of admission!

Geeta and Girija enjoyed the school experience in Cardiff and performed well. Their classes were small, up to 20 children per class, and the teacher

could devote attention to all children. They were encouraged to ask questions and the classes had no boring home work to do. The teaching methods also were new and I was particularly impressed by a classroom exercise in geometry. Every student was asked to draw on paper, a triangle of any size or shape and then cut it along the boundary. Then they were asked to cut off the three corners and align them against one another. And *voila!* The outer edge turned out to be a straight line for all types of triangles. This experiment was far more illuminating than the routine exercise of proving the Euclidean theorem that the three angles of a triangle add up to two right angles.

The 1980-81 trip is linked in my mind with many such pleasant experiences as well as some unpleasant ones. In the latter class was our misadventure in buying a second hand car. The first one we bought turned out not to be roadworthy. The second one had its engine failing and needing replacement, as well as having several other minor defects. The engine failure occurred at a time that could have been a lot more inconvenient than it turned out to be. The story briefly was as follows.

We had planned to visit the continent during the summer of 1980. I had an invitation from the Max Planck Institute for Astrophysics in Munich and our friend Judith Perry had made all arrangements for our stay. The car was equipped for European travel. I booked hotels on the way with the help of the AA travel service, since I had become member of the Automobile Association. We had been under the impression (which was confirmed by the German Consul in Cardiff) that we did not need a visa for Germany. However, we later received information that in a recent change of its immigration policy, the Federal Republic of Germany had made visas mandatory for Indian passport holders. Not only that, the visa could not be given in a third country like the UK, but had to be taken in the home country. There simply was no way of our getting visas in Cardiff under these conditions. So we had to cancel our trip to Germany and incur some expense for last-minute cancellations.

As luck would have it, we decided to use that time for a visit to Cambridge and set off from Cardiff one fine morning. On crossing the Severn Bridge, I noticed that the car was not accelerating despite my pressing the accelerator. I pulled over to the emergency shoulder and saw that the Engine was fuming and very hot. I decided that I needed expert advice and used the roadside emergency telephone. Within a quarter of an hour an AA assistant arrived on the scene. He diagnosed that the engine had packed up, a very serious defect that needed the car to be taken to the nearest Austin-Morris garage. As per the terms of my agreement with the AA, he could tow the car to the nearest garage,

which was in Swindon. After that it was up to me to decide on the course of action.

So here were we with two small children being towed along the motorway. At Swindon, they confirmed the AA-man's diagnosis and said that a new engine would cost £ 250, including labour and the job would take three days. We had no option but to agree to leave the car there and take a train from Swindon to Cambridge. We did that; and I was looking at the bright side of the picture that we had not been headed for the continent as per our earlier plan. If this problem had occurred on the way to Europe or in Europe, we would have been put to considerably greater expense.

However, this saga is not yet over! We came to Cambridge and went to the house of Jamal and Suraiya who had offered it to us for stay while they were abroad. We did our rounds of visiting old friends. We had already lost one. Dr Aphorpe Webb who had been our GP during the Cambridge days was no more. We called on Mrs Aphorpe Webb and had a nice chat. She was still in their big house on Maids Causeway, but was planning to sell it and move to a small flat. She invited Geeta and Girija to help themselves to children's books in her house and they very happily selected some to take home. George and Joyce Salt were delighted to meet us all and we had a very pleasant tea in their house. Contrary to his rather formidable and formal appearance, George was very friendly with young kids as we discovered when he got them absorbed in drawing pictures. We also saw the Baggas who had accommodated us in their house prior to our departure for India, after selling our house.

On the stipulated day I rang up the Swindon garage and was informed that the car was ready for pick up. I accordingly went to Swindon by train and collected the car. I drove it back and reached Cambridge in early afternoon. However, I had noticed that the engine temperature had risen very high. I dismissed the fact as being due to a longish drive. However, next morning when I drove it again, the temperature shot up within a few minutes. I decided to take it to the local Austin-Morris garage of Marshalls. They inspected the car and concluded that the water pump had failed. However, they assured me that the pump was part of the new engine fixed at Swindon and was therefore covered by guarantee. It was just our bad luck that the water pump was faulty. They took one day to change the engine again with a good water pump at no extra cost.

Our trip back to Cardiff was uneventful and gradually I got confidence that the car would be OK for long drives. So we planned a 2-day trip to the

Lake District to see the Hoyles at Cocklay Moor. Barbara Hoyle booked us into a guest house in Dockray, the village at the bottom of the hill, on whose top their house was. The Hoyles were very pleased to see all of us and I had a brief chat with Fred while Barbara entertained Mangala and the girls in the vast garden outside the house. The view of the surrounding hills was marvellous.

While on our way back, we had another hiccup with the car! I noticed that the petrol tank was leaking. Again on returning home I had to get it changed. It seemed that on this visit to the UK I was not having good luck with my used car. In retrospect, I would have done better by buying a better car by spending a little more initially. However, all said and done it is a chancy thing.

The most shocking news that we had during our one year stay in the UK was, however, the sudden passing away of Mangala's uncle R.G. ( Balasaheb) Rajwade. He normally enjoyed good health and had won "body-beautiful" award during his youth. However, he had neglected his health under pressure of work which had taken increasing part of his time and energy. As an accomplished negotiator and successful settler of labour disputes he had been much in demand in Bombay and Goa, during the industrial unrest of the 1970s. He had a massive heart attack which he could not survive. All of us, especially Mangala who had looked upon him as father (she had lost her father when she was just a few months old and Balasaheb had brought her up) were in a state of shock on hearing the news over telephone one morning.

As against tragic news like this and problems encountered with the car, we had some pleasant experiences too.

Perhaps the most pleasant and unexpected development for us was the indication that a new addition to the family was in the offing. In fact, we had been informed that Priya was expecting a baby and it duly arrived in February. Janaki was the little sister that Anil and Kamala had. When we had our two kids, the Wickramasinghes had followed within a few months with theirs. Now the situation was reversed. Geeta and Girija were to have a sibling in June, some four months *after* the arrival of Janaki. Because of late pregnancy, Mangala (like Priya) had been advised to have amniocentesis and the test had revealed the sex of the child to be born. It was to be a girl. We decided to name her Leelavati, for two reasons. Mangala had an aunt in Nagpur with the name Leela, who had succumbed to cancer. She had been very close to Mangala. The second reason was that this was the name of the legendary daughter of the twelfth century Indian mathematician Bhaskara. The book *Leelavati* by Bhaskara had contained the problems he had posed to Leelavati who was reportedly a mathematician herself.

There was now a choice for us: either to stay on longer in the UK (we were scheduled to go back in March) or return as planned and have the baby delivered in India. Since both Geeta and Girija were born in the UK we were familiar with the excellent arrangements for delivery of babies in the UK. However, Mangala's mother who ran a maternity home in Pune was insistent that at least on this occasion she be given the responsibility of delivering her grandchild. So we decided to head back to India in March.

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In 1986, I had attended the IAU symposium in Beijing, China. It was while attending the meeting that I encountered Jean-Claude Pecker, a senior professor at the prestigious College de France in Paris. He asked me if I would be available for a visit of two months at the College de France sometime in 1988. I was tempted by this possibility since on academic grounds I had some ideas in common with Jean-Claude: especially, we both disliked the big bang model. Moreover, a visiting professorship at the College de France was an honour in itself. In addition, the city of Paris had so many cultural attractions that would make a stay there very delightful. Jean-Claude was happy to have my affirmative reply and followed up the formalities of having me visit for two months from mid-April to mid-June in 1988. I had chosen these dates so that Mangala and my three daughters could join me there for the second month of my stay.

The College de France invitation also provided for accommodation for the visiting professor at the Fondation Hugo, belonging to the College in the neighbourhood of Saint Germain des Pres. Indeed Rive-gauche, that is, the area on the left bank of Seine and associated with artists and authors was one of the cultural hubs of Paris. For the first month of my visit I stayed there and walked or went by metro to College to deliver my lectures. I was expected to deliver eight lectures over the two months and these were arranged once a week.

As major repair works were going on in College de France, there was shortage of office space. For my working office, therefore I was given space in the Institut d'Astrophysique in the southern part of Paris, on Boulevard Arago, near the Place Denfert Rauchereau, the landmark of Paris dominated by Bartholdi's statue of a majestic lion. Jean-Claude had an office there and had arranged one for me as well. His secretary, Isabelle, was also extremely helpful, especially in connection with my family's visit. She accompanied me to the airport to bring them back in her car and, even more importantly, found

accommodation for us all since the one-room apartments at the Fondation Hugo were not suitable for accommodating the five of us.

We stayed on the top floor of an old hotel, in rue Mouffetard in an apartment having four rooms. It was quite spacious and conveniently located not too far from College de France and from Jean-Claude's own apartment in rue St Jacques.

Geeta had by then joined the IIT, Bombay but she could join us as her semester was effectively over. Girija was already free from her junior college term while Leelavati's school was closed for the summer holiday. (The Central School holidays began later than those of other schools in Maharashtra). As it turned out this was to be the last time that we five would be travelling abroad together as a family.

During their month in Paris we could visit the Louvre, Musee d'Orsay, the Pantheon, the Chateau de Versailles, and other landmarks of Paris and its neighbourhood. It was a very enjoyable month for all of us.

On academic front, my lectures went down well, although I did not see many conventional astronomers or physicists there. Jean-Claude explained that Paris was a very conservative place with the majority of scientists towing the line of conventional wisdom. He was something of an exception and those attending my talks were more in the maverick class like him. Although Jean-Claude was speaking from his personal experience, I felt that it was perhaps not fair to single out Paris as an exception. My field of cosmology had moved over the last three decades towards an increasingly conservative attitude, a fact that was noticeable in Cambridge, Princeton, Berkeley, Caltech or Moscow just as it was in Paris. I will have more to say on this theme towards the end of this work.

Once or twice a week we used to meet in Jean-Claude's rooms in Rue d'Ulm. On some occasions the physicist Vigier would be present and we had free and open ended discussions on the various puzzling aspects of physics. Vigier, when present would have many provocative ideas to discuss. There were also some occasions when he clean forgot that we had arranged to meet. Once, on such occasion when Jean-Claude rang up to find out what was the matter, his wife said that she had been worried too since he had not shown up at home either! Anyway, despite these episodes, our discussions eventually resulted in two papers.

I visited the USA for extended periods in 1975, 1977, 1979, 1982 and 1984, each time, except in 1982, with Mangala and the girls. I have already described the 1977 visit when my parents also came with us. Because of their failing strength and health in general, we never could repeat the experiment. In fact during later trips we had to make special arrangements for them to ensure that they could manage without us: for they had come to depend on us (especially on Mangala) for their day-to-day needs.

In 1975, we went to California first, and then Austin, Texas. I spent two months at Caltech (as guest of Willy Fowler) one month at the University of California at San Diego (as guest of Geoffrey Burbidge) and one month at the University of Texas (as guest of George Sudarshan). In the USA one tends to rely more and more on private transport and so we rented a car at weekends both in Pasadena and Austin, while we had a car for the entire month at the UCSD. I recall Geeta and Girija were surprised to see me drive a car, since at the Tata Institute they mostly had sat in staff cars or taxies which were driven by a professional driver.

Fred Hoyle had also visited Caltech that winter when we were there and we had some overlap. He delivered a public lecture in the Beckman Auditorium which had filled to capacity. We had also some interaction on our gravitation theory while we were there. At the UCSD Geoff Burbidge and I had a fruitful time analyzing the radio source data, which had become more complete since the early 1960s when Fred and Martin Ryle had their battle royal in which I was also a combatant. At Austin I shared with George some work on the cosmological applications of tachyons that is, particles moving faster than light.

The US trip had its personal highlights too, with us renewing our contacts with the Devadas family in Maryland and Yashoda Dilwali in New York. In fact the Devadas house had been our first stop in this trip and even at the height of winter in early January, the girls enjoyed their stay. We had stopped at Yashodaji's apartment on our way out of USA. It was spring by then and New York was reasonably warm with trees getting covered with leaves. Of course, California and Texas had been reasonably warm during the first quarter of the year and there we had taken Geeta and Girija to Disneyland, Sea World, Wild Animal Park and other children's attractions. From New York, we flew to London and then on to Cardiff where we were to spend three months as described earlier.

In 1979, Geoff had moved to Tucson, Arizona to take up the Directorship of the Kitt Peak National Observatory. Our interaction had developed since 1975 and he invited me to spend some time at Tucson. We arranged so that

Geeta and Girija would not miss much of their school term and this meant that we had to be in Arizona at the height of summer. To avoid going to Tucson at the height of summer, I managed to spend a couple of weeks at New York working with Victorio Canuto at the City College of New York.

Indeed, the Tucson temperatures above 110 F reminded me of the old Banaras days except that inside the house we had the benefit of airconditioning. But walking out in the open at midday even as far as the car was a torture. On our first day in Tucson we were accommodated in the Plaza Hotel only a block away from KPNO. We had a room from where one could see a Time / Temperature display panel on the street. In the afternoon the temperature started dropping and we decided to venture out only when it fell below 104 F.

Fortunately, we soon found an apartment within walking distance from the KPNO and I used to leave for work early in the morning and return when the height of heat was over. Here too we rented cars for weekends and once for a week also.

This latter was when I had a visit planned to the newly established radio telescope known as the Very Large Array at Socorro in New Mexico. I was to deliver a talk there and was advised to come by car the previous day. Rooms were reserved for us on the VLA site and I was told to arrive well before 5 p.m. since everything closed down after that hour. Accordingly we drove into the VLA campus at 4.45 p.m. by my watch, only to discover that I had failed to correct the time for New Mexico. Arizona adhered to Pacific time whereas New Mexico was on Mountain time. So the actual time was 5.45 p.m. well past the closing hour. Not surprisingly the site looked deserted and we were wondering how to find keys to the rooms we were allotted. Fortunately there was an observer in the control tower who found the caretaker who in turn found us the keys.

The accommodation was in two adjacent motel-like rooms. Normally we would have preferred all four of us sleeping in one room, instead of dividing between two rooms. Although one adult could have shared a room with one child, Geeta and Girija insisted that they would sleep in one room and we sleep in the other. We ensured that they knew how to lock the front door and use the chain and told them not to open it for anyone except us. Since there was working telephone in each room, we felt that there was no difficulty of communication. Indeed they were thrilled to be sleeping by themselves!

On the way back from Socorro we stopped to see the Meteor Crater and also the Petrified Wood National Park. We drove along to Phoenix where we stopped for a dinner with one of the daughters of our TIFR neighbour Professor

Naranan. By the time we arrived in Tucson it was well past midnight. As we had driven out of Socorro early in the morning, this was indeed a long day!

From Tucson we were to go to Los Angeles since I was attending an IAU Symposium at the University of California at Los Angeles. We were to stay with Vaman Ganu, younger brother of Anil Ganu. However, before going to his place we had planned to spend the day at Disneyland. Indeed I had the ‘brilliant’ idea of taking the overnight train from Tucson to Los Angeles which would bring us to LA early in the morning so we could spend the whole day at Disneyland.

When Geoffrey Burbidge heard of this scheme he burst out laughing and said that it was unrealistic to depend on the train. Knowing that Americans do not much patronize trains in favour of the automobile or the aeroplane, I thought this was simply propaganda against the train system. So we went ahead and booked a ‘drawing room’ for the family on the train to LA. Mangala who went to get the tickets, said that the booking clerk asked her to check the time of the train a few hours before its evening departure from Tucson. This seemed to us routine caution. Geoff had agreed to come with a car to take us to the station.

On the day of our departure, Mangala called the station around midday to check on the train. She was told that it was running three hours late. Hoping that it would make up part of the delay, we checked again later in the day and were told that the delay was now of five hours. I was becoming worried that we were losing time we had budgeted for at Disneyland, while Geoff’s reaction was predictably ‘I told you so’. A couple of hours later we found that the delay had extended to six hours and we decided to call the trip off. Mangala went to the station and received full refund of the fare paid, while Geoff called the airlines to book us on the first flight to LA in the morning. So Vaman was informed to come for us not at the LA station, but to the LA airport.

The rest of our trip was uneventful and we returned to India in early August. Geeta and Girija duly joined back their school.

The 1982 trip to Tucson was by me only and I stayed in one of the KPNO guest apartments. The following trip in 1984 was again with Mangala and family, now extended with the addition of Leelavati or *Leelu*. I went ahead for the first two months while they joined me after the school year closed. During my solo stay I was staying as a paying guest with Mildred Mathews, daughter of the famous astronomer Harlo Shapley. Mildred was a professional editor and I found her peering at manuscripts most of the time.

I had found a convenient apartment near KPNO for our last two months

stay in Tucson. We followed our usual routine of renting the cars on weekends, but now I was beginning to encounter one difficulty. The car rental companies had started demanding a credit card instead of cash deposit and so the choice of those that permitted the latter was narrowing. I nevertheless managed to rent one whenever needed. This time too we made a long trip to southern California to visit UCSD for a week. It was a pleasure to meet Margaret Burbidge, Devendra and Aruna Lal and Anand Sarabhai in La Jolla. When we returned we drove via Palm Springs where we enjoyed a date-shake in a desert-like environment. It was very hot outside and although the car was airconditioned, we still felt the need for cooler air.

While in California we paid another visit to Disneyland, this time to introduce Leelu, to this children's fun-park. Alas, the objective did not work out. While Geeta and Girija enjoyed the rides, this time more adventurous ones, Leelu, who was barely three years old, would set off a howl the moment a ride took one in darker environment. People around would watch with wonder why this child is scared of a really pleasurable ride. I was reminded of Geeta's similar reaction on her first visit to Disneyland at the age of eighteen months. Indeed there is a minimum age below which the child does not enjoy such rides.

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Till 1981, all my visits had been to the west. I had an opportunity to visit the East when there was a regional meeting of the IAU in Bandung, Indonesia. The local organizer had been Bambong Hidayat, a senior astronomer in Indonesia. He did an excellent job and all of us who attended the meeting have recollections of a well conducted conference with lavish hospitality.

But on my way to Bandung I stopped in Singapore and was immensely impressed by the miracle of development in that city. Indeed it was a demonstration that the easterners are no less than their western counterparts in civic discipline and ideas of progress, if they take them seriously. In 1960, Singapore would have been no better than Mumbai but in less than a couple of decades after gaining independence from Malaya, the city-state has transformed itself, and today Indian politicians talk of turning Mumbai into a Singapore!

I visited Singapore again after two years and was even more impressed by the fast progress it has made. In the 1990s I was taken round by a high official of Indian origin to show me the way the "metro" or the underground railway

was constructed in a remarkably short time and how efficiently it runs. The railway project was completed by his company *before* the stipulated time in the contract, for which it received bonus as per agreement. In India projects drag on beyond the stipulated date and there are the inevitable wrangles about penalties to be imposed on the contractor.

But perhaps the most impressive aspect of Singapore that India needs to emulate is the emphasis on civic cleanliness. There are heavy fines for littering the streets and other public areas, fines that are imposed in the rather rare situations when a person shows such a lapse. The discipline and avoidance of corruption are indeed the most admirable virtues of this tiny state.

## HOUSEHOLD ISSUES

**I**N the September of 1972, when we moved to Bombay, Geeta was two and a half years old while Girija was just four months. Apart from a change of climate, a more dusty environment and a more crowded ambience, the girls, especially Geeta had to get used to new friends, new language. She used to go to a play group in Cambridge where she mixed with children of 2-3 years old. Although a slow talker, she had begun to develop familiarity with English and could also understand nursery rhymes and short stories that we told her in English. We wanted her to be bilingual with Marathi as well as English at her command and so we used to talk to her in Marathi also. We continued that practice in Bombay.

As would be expected the B-1 Block with 99 flats had children of all age groups, and so there was no difficulty in Geeta and Girija having playmates of comparable ages. We also found that a play group for 2-3 year olds was run in the basement by two faculty wives from TIFR. So Geeta joined it and later Girija also took advantage of it. There the kids spoke English and Hindi of the Bombay variety. At home we spoke to them in Marathi as well as English, the latter when singing nursery rhymes or reading picture books. So it did not take them long to change over to a new style of existence without any great hassle.

When slightly older, of age in the 3-5 range we found nursery-KG schools for them. Thus Geeta went to St Joseph's Convent while Girija joined the Guild Nursery two years later. They used to go to school by the school-bus which also brought them home after a three hour session in the morning. This

arrangement worked very well and I do not recall either of the girls feeling home-sick in the early days at school. There was, however, one incident relating to Girija which in retrospect seems amusing but had caused us some concern at the time.

This took place when Girija showed reluctance towards going to school in the bus. On closer probing she said that she felt threatened by a couple of boys who were also riding the same bus to the same school. It seemed that the boys were talking amongst themselves about their plans to cut Girija's nose the next time they travelled in the bus! Since there was a senior supervisory person in the bus, we did not have any real worry. However, to satisfy Girija we requested the lady to see to it that Girija was not harassed on the bus. This seemed to satisfy her qualms and there was no recurrence of the incident.

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The real problem (for us) came when we were to admit the girls to a primary school where education for the first standard would be given. I realized that compared to getting gas, electricity, telephone, milk, etc., it was more of an ordeal to get your child into the school you want. Mangala and I wanted our daughters to go to the Central School or Kendriya Vidyalaya, which was within two hundred metres distance to the school. It had several advantages. First, it was within walking distance and so one did not have to depend on bus or other transport. Secondly, it followed the Central Board of School Curriculum which was uniform all over India and was pitched at a higher level than that followed in the state schools. Thirdly the central schools followed a mixed medium of instruction: science and maths as well as English language were taught in English while social studies and Hindi were taught in Hindi. Last, and not the least, the classes had a limit of forty students as opposed to 70-80 in state schools. The catch, however, was that the central school system was meant mainly for the children of government employees in the first place, especially those with transferable jobs. People like us therefore belonged to the bottom in the priority list for admission.

Most of my colleagues at TIFR, however, were swayed by the attraction of English medium and opted for the high profile English medium schools despite large fees and long waiting lists. In fact a few years before I joined, the Principal of the local Central School had offered to keep a quota of seats for TIFR children, since the school was at the doorstep of TIFR. However, the offer was not taken up, which was a pity. Soon as the naval establishment

around TIFR grew, the demand on the Central School increased. Although eventually there were four schools of that system in Navy Nagar, the number of seats available fell short of demand.

So when my wife and I dropped in to see the Principal of the Central School to enquire about the possibility of admitting Geeta at the age of five, he was sympathetic to our request, but could not guarantee a seat. He said that the naval staff children had top priority and till they were all accommodated, he could not look at other requests. At a personal level, however, he assured us that eventually, that is within a month or so he expected the situation to ease and he would 'get her in after the dust has settled down'. The phrase used by him aptly summarized the situation: he would place her as a late entry after all the other admissions were over thus avoiding running into any controversial situation.

As an additional precaution he asked me to write a special application to the Assistant Commissioner in charge of the Central School System in Mumbai and neighbourhood. The Assistant Commissioner's office was in the campus of the Indian Institute of Technology, Mumbai at Powai. The Principal felt that he would be in a stronger position to admit my daughter if he got permission from this higher authority. I wrote a letter accordingly and hoped for the best. A few days later I received a phone call from Powai. The Assistant Commissioner himself was on the line. He introduced himself as coming from Bangalore and he was ecstatic that he was talking to me! For, he had happy recollections of my public lecture in Bangalore in 1965, when he was still a student. He had been moved by my talk and said that he would be only too happy to grant my request. So I later said to Mangala that this incident demonstrated that a talk on an astronomical topic can actually yield a dividend!

So, in late July of 1975, we received the green signal from the Principal and took Geeta for an interview. We were rather amused that parents along with the child are interviewed for school admission. The interview is, however, taken seriously. The Principal asked Geeta to write some letters from the English alphabet, which she did. She also wrote out digits from one to nine. We had taught her these anyway at home. However, when the Principal asked her to write some Hindi letters, this was a googley! We had not yet introduced her to the Devanagari script and had expected this to be taught at school in her first standard. Anyway, this handicap was not serious and the Principal okayed her for entry. He asked us to take her to the A-division of the first standard where one Miss Kale was the class teacher. We went to the class and duly introduced

her to the teacher. Miss Kale seemed rather overwhelmed that my daughter was to be her student! For she had heard about my work.

Geeta was quite happy at this school and so when two years later we had Girija ready for admission, the drill was repeated. The same Principal was in office. On this occasion too we took Girija late for admission ‘after the dust had settled down’. However, this time too there was uncertainty.

The situation over the last two years had worsened so far as non-navy children were concerned, because the local central schools were hard pressed to accommodate the local navy children. At the time we considered as a standby, admitting Girija to the G.D. Somani School in Colaba (not very far from the Hotel President), but the Principal there advised us to wait till we had a ‘No’ from the Central School. For, he felt that the Central School Principal would eventually agree to our request. In any case, he assured us that if we got a ‘No’ there, he will give her admission despite being past the deadline. The Principal of the Central School, when he heard of our sounding another school became doubly reassuring that he would definitely admit Girija ‘in due course’ which he did.

Fortunately, the problem had eased somewhat in 1986 when Leelavati was ready for school. For, by then the School had a small discretionary quota for cases such as ours. I must say that as parents we were entirely happy with the Central School and felt that all the reasons we had for going to the local school in preference to the more fancy schools in Colaba or the Fort area were justified. At one such school patronized by my TIFR colleagues, there were children of wealthy families. The TIFR children used the city and TIFR bus system to go to school as there was no school bus. Most other children were accustomed to coming in their parents’ chauffeur- driven cars and would argue amongst themselves as to whose car was best. The government sponsored ambassador car was of course regarded as at low level in this comparison with the far more expensive imported models. At another school interview the TIFR scientist was asked what was his profession and when he mentioned that he was working at TIFR, he was told “Then you should think twice before admitting your son here as you may not be able to afford the fees.”

It is often argued that education in an English medium school is essential if the child is to progress in life with a good career. This argument is utterly nonsensical. While English is needed to be taught from an early age because it has become the main link language in India as well as in the world, the comprehension of the subject is best achieved in the mother tongue of the

child. I do not think our family (Mangala and I and our daughters) in any way suffered because of not going to an English medium school.

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My own upbringing was greatly helped by close interaction with my parents through stories and mathematical puzzles. Mangala and I set great store by this interaction. As our daughters grew I started telling them stories, either from books or ones made up by myself. The made up ones were made on the spot with characters as per the stipulations of the listeners. The imagination of the listeners often ran wild and I had a tough time accommodating all the diverse characters in one story. But it was great fun.

At bedtime, I also read out stories of all sorts from books as my mother had done during my childhood. These stories were sometimes from the very same books that Tai had read out from. However, an addition to them was books by Enid Blyton. However, as I read them I found that Geeta was not content with stopping for the night where I did and to satisfy her curiosity as to what happened next, began to read the books herself. Thus in a natural way she acquired the habit and love of reading books. Girija later did the same and so my role as story-teller gradually came to a close until its revival 8-9 years later for Leelavati.

The mathematical puzzles also served a convenient way of introducing them to the pleasures and recreations of mathematics. Here again, some of my early puzzle books came in useful.

Geeta and Girija shared the bedroom with my parents and one of the benefits of this arrangement was that they were introduced to various Sanskrit verses. Tai, who had taught Anant and me to recite various well known *shlokas* now recalled those and had Geeta and Girija (and later Leelavati) learn to recite them. By then the technology had enabled us to record some of those sessions on cassettes and they form a valuable set of memorabilia today.

I think such interaction of children with parents and grandparents has salutary effect on their upbringing. Today, unfortunately this source of cultural impact on a young mind is fast becoming rare. There are very few joint families. The normal parents + children unit today suffers from severe shortage of time together. Parents both work and have long hours outside the home. Children attend various coaching classes and are lucky if they get time for play. Thus compared to children in today's urban family life, my daughters were more fortunate. And our childhood was even more relaxed.

It is true that one may argue that in my childhood I did not have access to TV. Certainly, I would have loved to watch Don Bradman play, see Dhyan Chand score a stream of goals, or see the All England badminton finals. Had TV been there, I could have watched Jawaharlal Nehru herald India's independence, or been shocked by the massacres at partition or seen Churchill show the V-sign to signify the end of World War II. Today's children have access to events like these which can be highly educative. But they also have access in a far greater measure, to the load of trash that is peddled on almost all channels. These programmes can be distracting and take the viewers away from their studies or even more importantly, from interacting with their parents. I feel that on the whole not having a TV to distract my mind I was more fortunate as a child than today's children.

What about discipline? We did not have to 'rule with an iron hand'. There were occasions when the girls needed to be scolded. In my own early childhood, my brother and I were sometimes locked up in the bathroom. There was no occasion when we exercised a similar punishment on our daughters. A word in season was generally sufficient.

Nevertheless, there were occasions when they strayed from the straight and narrow path. Once our neighbour in the Bhaskara Building came in with Geeta, then hardly three years old. This lady had found Geeta standing talking to the seller of *Chana-jor-garam* (roasted chick peas) who had stationed himself just outside the compound wall of our colony. We could not figure out how Geeta had managed to evade the watchman and go outside the gate all by herself. She had obviously liked the chick-peas when we had once got them for her from the very same vendor. That day, all by herself she was trying to see if she could get a fistful with her own efforts. However, she was without the essential commodity called 'money'. Lack of any funds had thus been the reason for her not succeeding!

At a senior age, when she was at the junior college, I recall getting very angry with Girija when she spent an abnormally long time on the streets of Bombay collecting for some charity and returned home late. On this occasion, I recall that while Girija was crestfallen at my admonition, Geeta voiced sympathy for her sister and complained to their mother that father was being unnecessarily harsh!

While there were occasional sisterly skirmishes between Geeta and Girija, Leelavati enjoyed indulgence from everybody in the household, coming as she did nine years after Girija. As Mangala and I jokingly say, we had almost forgotten how to bring up babies when she arrived. But I must admit that

despite her various pranks, she never 'rose to the level of a spoilt child' of the kind we had seen in several families we knew well.

However, one occasion of conflict arose when, after entering the junior college, Leelavati wanted to buy a scooter. I agreed provided she would wear a helmet while riding. This she refused to do on the grounds that she would lose face in front of all her friends. While we were arguing back and forth, Mangala called the mother of her closest friend and together they agreed to compulsorily impose the helmet on their scooter riding daughters. They succeeded since now two girls were involved !

Finally, how did my parents treat them? It was interesting to see that as grandparents they were much softer to them than they were to us as parents. But that is probably a general syndrome. Nevertheless, their presence in the house certainly had a salutary effect on the upbringing of our children.

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Elsewhere I have described our family visits abroad. Within India we travelled as a family to many parts of the country, each trip being a memorable one. My work in the form of lectures or leave under the Leave Travel Concession, could be combined with touring to such places as Ooty, Naini Tal, Mussourie, Delhi, Bangalore, Banaras, etc. After moving to Bombay, my parents became less and less comfortable with the idea of travelling. For, they had a set daily routine and this could not be guaranteed when travelling. They came to Pune or Kolhapur quite frequently with us, since that travel was a short one and they were well familiar with the city.

In Pune we usually stayed with Mangala's mother Kumutai, as she was generally known. She had a flat in the neighbourhood of the Kamala Nehru Park, a central area in Pune from where it was easy to travel to other places in the town. My parents preferred to stay in the Pune University Guest House or in Hotel Shreyas where they could have western toilet facilities. While Vasantmama was in Pune University, they had a special attraction in going there.

Hotel Shreyas was owned by Balmama, Kumutai's brother Balasaheb Chitale who was a person with strong RSS beliefs. He had been in the civil engineering profession and had finally turned to hotel construction and then to hotel management. Hotel Shreyas was his 'baby' which he had nurtured into a leading hotel in Pune.

Vasantmama had been in Pune University since the early 1950s and had

developed the Department of Mathematics and Statistics into one of the leading departments in the country. In 1975, he decided to go abroad on leave of absence, as a visiting professor at the University of Winnipeg in Canada. He had his leave extended till he retired from Pune University in 1977. He, however, continued to work in North America, moving later to the Department of Statistics and Business Administration at the University of Denver.

My other ‘mama’s were in Bombay, Pune and Kolhapur. After moving to Bombay, our contacts with Dadamama and Morumama were more frequent. Dadamama used to work in the Tata Power Company’s South Bombay office and often dropped in with some goodies like sweets, flowers or fruits that he had picked up in the VT area. He was also a music critic and often reported on the important musical programmes in Bombay. Morumama had continued to rise in his academic position and stature as a teacher of mathematics at the Institutue of Science (the former RIS), and retired as its director. Unfortunately his eyesight, never very good at the best of times, deteriorated and he was nearly blind during the last few years at the IS. Yet he was excellent as a teacher and several bright students (including Mangala!) were inspired by him.

Nanamama, the judge was on a transferable job as District Judge, but eventually retired in Pune where he stayed for many years. We used to meet him and his family whenever we came to Pune, although he seldom came to Bombay. I do recall, however, in the early 1970s, all of us visiting him for lunch in his Thane house...since at the time he was serving in Thane. That was one of the rare occasions when we travelled in a Bombay local. On a Sunday, the harbour line local was not crowded and we had a pleasant time going to Thane and back.

Our visits to Kolhapur were around once in two years. Not of long duration like the vacation trips of my childhood. These were usually linked with my lecturing commitments at the Shivaji University. Dr Radhakrishna, a former student of my father from the BHU days was in the Maths Department, which he later headed. He used to arrange lectures and workshops for college teachers at which my father and I lectured. We used to stay in the University Guest House and later we also enjoyed the warm and lavish hospitality of Dr Vinudada Vaze. Mrs Vaze was an aunt of Mangala and both of them insisted that we stayed with them in their house in Tarabai Park.

But on such trips, visits to the ancestral home in Mahadwar Road and the Huzurbazar Wada in Bhende Galli were a must. As mentioned earlier, my Kaka had passed away in 1967 and he was survived by Kaki and Sushilatai who always welcomed us with big meals where we also got to meet other close

relatives and friends of the Narlikar family like the Sapre brothers (Baburao and Narayanrao), Khandkars, Datta Patil, etc. The Huzurbazar wada was now occupied by my youngest mama, Mukundmama and his family. In the 1980s it went the way of other old wadas...it was demolished and replaced by an ugly block of flats. The builder took a very long time to do this bad job and poor Mukundmama had to spend several years in hired accommodation till he could move back to the flat in the new building. That such a transformation from a wada to a block of flats will turn out to be a failure of architecture or a success very much depends on the architect and builder. The Narlikar Bhavan was similarly transformed in 2004 and the result was a success. But more about it later.

In Kolhapur we also visited my two aunts. Akkamavashi (Moghe) was still living in their old wada in Bhende Galli. Kusummavashi (Mudshingikar) lived in Rajarampuri. My Moghe cousins were all absorbed in their different professions in different cities, although whenever we met the old memories of our childhood pranks would surface.

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Apart from the usual round of infectious diseases, colds, coughs, fever, etc., Geeta, Girija and Leelavati did not suffer from any major illnesses. Soon after coming from Cambridge, Geeta developed skin rash as probable reaction to allergy of some sort. She had minor instances of this in Cambridge also, but she had not been too bothered by it. However, in Bombay the rash became more ubiquitous and she made it worse by scratching the itching parts.

We tried both allopathic and homeopathic treatments from well known doctors, but no medicine could provide permanent relief. Just then we heard of a specialist in Dadar who had acquired testing equipment that enabled one to detect the possible sources of allergy in the patient. We had Geeta tested and were horrified to see the long list of substances like rice, lentils, milk, etc., which formed part of a normal diet, to which she was allergic. Clearly we could not give her food that avoided all of these common ingredients.

At this time, in 1973, I had gone to Cambridge and there happened to meet Peter and Dorothy Eggleton, whose eldest daughter Carolyn had passed through such an 'allergic' phase. Dorothy is herself a medical practitioner and so I thought, her advice would be very useful. She mentioned that in most cases these allergies disappear after the first 4-5 years and hopefully Geeta

might come through just as Carolyn had. This was reassuring and proved to be correct, as after five years Geeta did not report any recurrence of this trouble.

At the other end of the age spectrum, my parents, since coming to Bombay, got progressively weaker. Tai did not have any major problem, except occasional bouts of migraine like headaches and dizziness. My father, who already suffered from diabetes, however, developed high blood pressure and ischemic heart disease. On two occasions he had to be hospitalized and placed under intensive care. He pulled through on each occasion, but with a weaker constitution. In 1980, when we were abroad, he also had a surgery to dissolve kidney stones. Drs Durga Dutt Gaur and Ajit Phadke looked after him very well on many such occasions. They had high regard for him and I will for ever be grateful to them for the care they took of him.

I find it worth mentioning what I believe to be an anomaly in the charging system in some of the leading hospitals in Bombay. On one of the occasions, when my father was admitted to the ICCU in a major hospital, there was no room available in the First Class. So he was kept for three days in the Second Class. This had no space for the bed of an accompanying person, and I being in that stage slept on the floor. Later he was shifted to First Class, where all these facilities were available. When it came to paying the bill, we noticed that he had been charged for First Class for the *entire period* of his stay in the hospital. When we drew attention of the manager of the hospital, whom my father knew well from his Ajmer days, he explained that regardless of what class the patient was in part of the time, he is charged for the highest class for the entire period. This is based on the premise that the patient paying first class is able to afford it and so should pay at that level even if he did not have that facility part of the time. To me it is like charging a railway passenger for first class travel even though he has travelled second class for half the journey.

Despite all these health problems my parents assiduously followed a very regular daily routine as recommended by their medical consultants. Although at the time of hospitalization, I did feel very anxious, I also knew that with increasing age such serious setbacks in health are not unexpected.

But what hit me as a bolt from the blue was when Mangala herself went through a medical ordeal. In July 1986, she noticed a lump on her left breast. When she reported this to the Medical Officer of the Atomic Energy CHS system, she was advised an immediate check up at the Tata Memorial Cancer Hospital. Ajit Phadke was very helpful in getting no less an expert than the senior specialist Dr Praful Desai to examine her. Dr Desai also advised immediate operation after the biopsy indicated possible malignancy. He himself operated

on her within a week or so. His prognosis after removing some affected lymph nodes was not very positive.

I was in a state of shock and like many others in a similar state kept asking myself "Why did it happen to her?" Having lost an aunt to breast cancer that had spread, the medical odds would have supplied a possible answer. But one always likes to beat the odds! As I waited for Mangala to regain her consciousness after the surgery, I could not help breaking down. This was only the second time in my life that I had broken down at a medical reverse. It was Kumutai who was also present at Mangala's bedside who consoled me, saying that not all was lost and that there were cases where patients had pulled through. She mentioned that mental strength of a patient can also contribute to the healing process and as such all of us have to keep Mangala in a buoyant frame of mind. Thus it was necessary that we presented a calm and composed profile. I took this advice and went on with my duties as normal. By the time that Mangala came to, I could make reassuring remarks to her.

There were some senior relations who advised that we should offer a special pooja to the Ambabai Temple (our family goddess in Kolhapur) to pray for Mangala's recovery. Again, I was in two minds whether to accept this advice from the elders, when my father spoke out his views. He said that such an action on my part would be seen as a mark of superstition on my part and would be against the very beliefs that I had stood for. If Mangala was to recover, she needed her own will power for it along with the best available medical help that we were already getting. I agreed with him and dropped the idea. I mention this as a personal example of how one can be swayed away from rationality when faced with a catastrophic situation.

Mangala had been advised radiation therapy followed by chemotherapy. It was a long drawn out protocol, but she stayed firm with it. Within a year she began to return to normal state and by 1988 she was regarding herself as one of the fortunate ones who had pulled through. But her ordeal was not yet over.

In October 1988, she discovered a small lump on her neck and when she reported it to Praful Desai, he had it taken out and tested. Yes, it was malignant and of a severer kind than before. "Why did it happen, Doctor?" I asked anxiously. "Professor, I wish I could give you an answer" he replied with a wan smile "But I can't. We know so little about this disease: but we do our best to prevent its recurrence. I hope that your wife will pull through this time."

So he made no promises. The chemotherapy this time was very severe and Mangala lost hair from her head and began to use a wig. But she had that asset which only she could provide: a firm resolve to get well. We also contacted

the medical adviser to Dalai Lama, who had medicines that were known to combat cancer. Her daughter used to visit Bombay once a month and Mangala used to report to her also. The medicine she prescribed made the body stronger in order to face the destructive element of chemotherapy. Later Mangala had similar medicines from Vaidya Nanal in Pune whose experience in treating cancer patients was well known.

Gradually, as the years rolled by and there was no recurrence of cancer, she felt more confident. She kept reporting to the Tata Memorial Hospital and was told one day that she need not do so any longer. At the time of writing, more than twenty five years have elapsed and we keep our fingers crossed. As Prafulbhai said, we cannot know for certain but we hope that she has pulled through.

## PUBLIC OUTREACH

IN 1963, I had been approached by the popular science magazine *Discovery* in the UK to write an article on ‘gravitational collapse’. This was at a time when the quasars had just been discovered. These were mysterious objects that resembled stars in their outward appearance but differed from them in many ways. It was believed, as per the suggestion of Fred Hoyle and William Fowler, that these were highly dense objects containing masses million to billion times the mass of a star like the Sun. Hoyle and Fowler had argued that such objects would be difficult to keep in balance at a fixed size like a star. In a star, the fixed size is determined by the equilibrium between the attractive force of gravity and the outward directed forces of gas and radiation pressure. These latter forces arise because the star is able to maintain a furnace of nuclear reactions that generate very high temperatures in the core. Hoyle and Fowler repeated the standard stellar model calculations for such massive objects and concluded that the force of gravity was so enormous that the objects will shrink and shrink with ever increasing rapidity.

Such a ‘run-away’ behaviour was called *gravitational collapse*. Even in the case of the Sun, one can show that if there were no forces of pressure to prevent gravitational contraction the Sun would collapse to a point in a matter of minutes, twenty nine minutes to be precise! Naturally the discovery of quasars had aroused interest amongst scientists about the phenomenon of gravitational collapse. This is what *Discovery* wanted to describe to its readers.

I do not know how the Editor of the magazine was motivated to get in

touch with me. Perhaps, Dennis Sciama, a senior scientist at Cambridge who often wrote for *Discovery*, may have suggested my name. Whatever be the case, the request to write an article was a challenge to me, since I had never before written a scientific article for a lay reader. My Guru, Fred Hoyle was a past master in the art and gave me some tips on how to go about it. Anyway, I recall writing the article entirely on my own and sending it to the Editor for his perusal. The Editor liked it and it eventually appeared in 1964, January with very minor editorial changes. It received a good reader response judging by the feedback I got verbally from some Cambridge colleagues, and from readers through their letters. I was somewhat puzzled and amused by receiving requests for reprints from medical doctors, amongst others, of course. I wonder whether the title of the article suggested to them some disease!

Since then I had continued writing for the lay reader when opportunity presented itself. The *Discovery*, unfortunately went out of circulation soon but I found *The New Scientist* in London a good medium. Later I came to meet Surendra Jha, the Editor of *Science Today*, a popular science magazine run by the same company that published the *Times of India*. So when I returned to India, my contact with that magazine was strengthened and there were several articles that I contributed to it, thanks to the persistence of Surendra Jha in getting me to write.

Later, because of some internal politics in his company, Jha quit his job and was invited by the Nehru Centre to start another popular science magazine, which was called the *Science Age*. My contributions to both this magazine as well as to *Science Today*, which later changed name to *2001*, continued and were very much appreciated by readers, judging by the letters I received. However, the economics of the journalistic world is such that both these magazines had to cease publication.

I discovered that science writing has a lot of scope in India. The common man with some educational background is curious about science and likes to know what is going on in the science and technology world. The difficult trick is to be able to keep his attention intact while describing the interesting developments in S&T. One needs to avoid technical jargon, employ analogies to explain difficult concepts, use stories and anecdotes, etc. And all through this one needs to ensure that there is no departure from accuracy in whatever scientific statements that are made. This might sound like balancing on a thin wire, but once the knack is attained, the feedback received more than compensates for the hard work put into learning science writing.

Another fact that I learnt was that India has many languages and science

can be explained best in the mother tongue of the reader. There are magazines and newspaper supplements devoted to popular science writing and one can reach out even to readers far from the urban settings. There are NGOs that try to spread science amongst the masses and they have magazines and other means of communicating to large populations. I personally found that the Marathi Vidnyan Parishad in Mumbai has an excellent infrastructure for such efforts. Indeed I had the honour of being its President for three years and so got to know its modus operandi close at hand.

However, having said all this, I feel that much needs to be done to get science to the masses. It is one thing to talk in terms of the cliché that we live in the age of science; it is another to acquaint the society with what science is and what are the implications of its discoveries for its betterment as well as for its survival. I will have more to say on this topic later in this chapter.

Perhaps my most successful attempt to write a popular book on astronomy was the Marathi book *Akashashi jadale nate*, (a line from the famous *Geetaramayana* by G.D. Madgulkar) meaning “A close relationship with the heavens was established”. This book presents the recent developments in astronomy against the backdrop of historical anecdotes and is illustrated with diagrams and photographs, many in colour. The publisher Dileep Mazgaonkar was responsible for prompting me to write this book, which he made sure would reach a wide cross-section of readers. Despite a price tag of over Rs 500, the book ran into several editions with a total sale exceeding 5000, which is unheard of for non-fiction Marathi literature.

Indeed, I can say that I have enjoyed writing about science in Marathi and Hindi, as well as English and continue to do so to this day. My main concern is that there is a very small fraction of scientists who do this job. More of my colleagues should take up this challenge to bring science to the masses using their pen (or their word processors or laptops!).

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It was the example of Fred Hoyle that inspired me into science writing for the masses. In 1974, I went further, trying to emulate him by writing a short story of science fiction. This turned out to be the thin end of a wedge and I have been writing science fiction since then whenever time permits and, more importantly, I have an idea to write about. Indeed, the story of how I started along this path may interest the readers.

The Marathi Vidnyan Parishad (MVP), which I have already referred to,

had started an annual competition of science fiction short stories. Contestants were asked to send a science fiction story written by them within a word-length of 2000. These stories were judged by a panel of experts and the first three were given prizes. I had been thinking idly of entering this competition, but was waiting for an idea that I could describe well in fictional format. Also I needed spare time to do so, if an idea did hit me.

In the autumn of 1974, I was attending a symposium in Ahmedabad, and during a particular lecture, the speaker was so boring that I soon lost interest in what he was trying to say. To while away the time I pulled up the conference note-pad and started writing a story related to the time dilatation near a black hole. Near a black hole, the gravitational force is so strong that time ‘runs’ slow. Any evolution therefore would proceed more slowly close to a black hole than away from it. The challenge before me was to put this idea in a story form. Surprisingly, once I started writing, words came smoothly and elegantly. The story was half written by the time the speaker had finished his talk. I was able to complete it within a few days.

The next question was how to submit it! I knew several officials of the MVP and they knew me well. It was likely that the examiners (whosoever they were) might be familiar with my name and this may give me an ‘unfair advantage’ over other competitors most of whom were novices (like me!). So I had the story re-transcribed by Mangala in her handwriting (- lest my handwriting were known-), and submitted it under the name Narayan Vinayak Jagtap (- a possible, but unlikely give-away being that the initials were in reverse sequence to mine -). The article was sent from another address and I waited for the outcome.

In due course, Mr Jagtap received communication from the MVP secretary that his story was judged the best and could he come for the annual function of the MVP to receive the award. At this stage I felt it appropriate to disclose my true identity, much to the surprise of the MVP officials who had not thought that I would take part in their competition.

The story does not end there! A few weeks later, the annual conference of Marathi literateurs took place at Karad and the President of the conference, the distinguished Smt Durgabai Bhagawat took note of my story in her presidential address and said that it promised to open a new corridor of science fiction in Marathi language. Normally a very strict critic, Durgabai was known to set high standards and her encouraging remarks not only prompted me to write further stories, but also led other promising writers to take up this literary genre seriously.

Shortly after, I received an invitation from Shri Mukundrao Kirloskar to write a sci-fi short story for his well established monthly called *Kirloskar*. This periodical had a long tradition dating back to the origin of the industrial empire of the Kirloskar family in south Maharashtra. It had played a seminal role in generating social enlightenment. I had been writing a mathematical column for it to generate a ‘mathematics-friendly’ feeling amongst the lay readership. I wrote a story *Ujavya sondecha Ganapati* (Ganesha with the trunk turned to the right) which was well received. Since then I wrote many other stories for this periodical as well as for others like the Diwali numbers of *Maharashtra Times*.

By now I have written over thirty sci-fi stories and five novels in Marathi. Some have been translated in Hindi by me as well as by others. I have also translated quite a few of them in English. I have received good reader responses. I have also noticed that even school children while writing to me sometimes probe into the rationality of the decision taken by my fictional characters. That science is a logically developed subject is an idea that seems to have been appreciated by these readers. Indeed it was a note of recognition for me when the venerated literary publisher S. P. Bhagawat (-no relation to Durgabai) asked me to let him publish my first collection of short stories under his prestigious ‘Mauj’ imprint.

Despite this recognition, I still do not think that science fiction has reached a respectable level in the Marathi literary world. It is still ignored in the annual literary convention: and at best, a minor place allotted to it. Nor have well recognized story writers or novelists taken much note of what is written. This is most likely because of the general feeling (ill-founded though it is) that science is an esoteric topic that is difficult to understand and relate to life. On the contrary, science has become a force that drives social evolution, a force that cannot be ignored. I very much hope that thus genre will soon get the literary recognition that it deserves. In this context, I like to give the example of my former neighbor at King’s, Morgan Forster, who despite a ‘science-free’ classical education in Victorian-Edwardian England wrote an excellent science fiction story called *The Machine Stops*.

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My relationship with the radio had started in 1963, when the All India Radio, Jaipur had recorded a talk by me on cosmology. This has continued to this day with talks and literary skits. In Bombay, Jayant Erande, a senior official at the AIR, was particularly keen to involve me in various science related activities.

He used to arrange Akashvani Sammelan, that is a convention based around the radio. I recall spending a day with the Sammelan in Jalgaon. When my science fiction became more well known, the AIR asked me to write short plays for children with child actors. I wrote a series in which five child characters regularly participated.

The Bombay Doordarshan (TV) had started its programmes in 1972 and one of the producers wanted me to appear for a personal interview to be telecast live. (Those days there was shortage of video tapes and so it was not possible to store the programme and broadcast it at a suitable hour later. In fact several programmes of great archival value were 'lost' because of this restriction.) This needed a good question-master and precise planning, and I could think of no better person than Surendr Jha. The interview went off well. Several viewers were appreciative of the well focussed questions that Mr Jha was asking, not knowing that questions as well as answers had been well rehearsed beforehand!

There have been several televised discussions that I took part in. Not all turned out to be as well structured. Indeed, in some the audience reaction included criticism of some speaker (not me!) for spending lot of time in irrelevancies, or of the compare for talking too much. Still, such programmes do serve a useful purpose in bringing science closer to the typical viewer. One series that was very popular on the Mumbai Marathi Doordarshan channel was called "Akashashi jadale nate" (this same title was used by me for my popular astronomy book two decades later). This was a discussion of celestial phenomena by four scientists together with projection of slides. On one occasion there was a near disaster when the carefully arranged slides got mixed up and we had to turn our discussion to relate to the slide that was projected on the screen, without any prior notice! As the programme was live, nothing could be done by way of reshooting.

The shortage of tapes available to Doordarshan meant that many of the programmes had to be wiped off. A few years later, a publisher wanted to bring out CDs of our programme, only to be told that it no longer existed! Indeed many programmes of great archival value were lost because of the narrow vision of the concerned authorities in the Information and Broadcasting Department of the Government of India.

In the mid-1980s I was asked to take part in a novel experiment. Carl Sagan's famous programme of 13 episodes called *The Cosmos* was to be broadcast. The programme was in English, but the TVchannel wanted it to reach more people and asked me to give a short summary of the programme in Hindi to

be broadcast just before each episode. This experiment succeeded very well and I received audience reaction from all over India. I also realized then that if one goes down to the language of the viewer, what you want to say is appreciated far more than in English.

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In 1985, during a convocation of *Viswabharati*, the university established by Ravindra Nath Tagore, I received the Ratheendra Award at the hands of the Chancellor who was none other than the then Prime Minister Rajiv Gandhi. Rajiv also praised my introduction of the *Cosmos* programme. Taking cue from this I expressed my view that a locally made astronomy series in Hindi would go down much more effectively. He asked me if I would be willing to make one. I did not expect this enquiry coming at the end of my casual comment; and felt that I should take up the challenge if it was posed. On my replying in the affirmative, he asked Mani Shankar Ayyer to follow up the idea with me so that we have a Hindi series on astronomy.

After returning from Shantiniketan I almost forgot this conversation. But within a month or so, I received a call from Mr Chandra, Chief Producer of Films Division (FD) of the I&B Ministry requesting time to discuss this idea. The FD had been told to place its infrastructure at my disposal for making a Hindi serial in astronomy. So here was the ball well and truly in my court and I had to play it well.

I must say, I received very good cooperation from FD for making this serial which we decided to call *Brahmand* (meaning 'the Universe'). From Mr Chandra downwards there were producers, directors, camera crews, set-craftsmen, all were very excited with the idea of making such a series. Unfortunately, there were several brakes also, from the inbuilt bureaucracy, lack of funding strategy, resistance to employing outside talent, etc. that slowed the project considerably. By the time some 17 episodes were made, nearly a decade had passed. My one great regret was that Rajiv was not alive to see the final product when it was aired on Doordarshan. It was well liked and broadcast many times. I had used school children as part of the storyline of each episode and so children could very well identify themselves with the programme.

Apart from the Films Division, I had also a brief association with the Children's Film Society of India. The CFSI made a film based on my science fiction story *Dhoomaketu* (meaning 'the Comet'). It has had mixed reception. According to critics, the producer had added a lot of unnecessary sensationalism

to a story that was full of suspense of scientific nature anyway. It has been shown on TV many times.

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Apart from the pen and the audio-visual media, the importance of direct lecturing cannot be ignored. The lecture provides a live confrontation between the speaker and the audience. As such public lectures on science related topics have a useful role to play. I started giving public lectures in English to general audiences, soon after my return to Bombay. However, the MVP invited me to be the President of their annual convention in Jalna in 1973 and there I was required to deliver my address in Marathi. I wrote out the address in English first and then translated it myself into Marathi and took help from experts for special technical words. My father and Mangala also helped. I then read out the address at the convention.

From this rather laborious stage to an impromptu extempore speech in Marathi, was a long journey, but I got there in about two years. I likewise developed the knack of public speaking in Hindi. After 1957, I did not have the opportunity of speaking in Hindi, but I discovered that the old childhood skill is not easily forgotten. On both counts, Marathi and Hindi, I have noticed that the effectiveness of what you wish to say goes up enormously if you are speaking in the mother tongue of the audience.

In 1981, I had to deliver the Public Lecture of the Astronomical Society of India at Gorakhpur. It was advertised widely with its English title and had attracted a large audience. Just before I was to start, the local organizers approached me with the request that I should speak in Hindi as the major part of the audience was comfortable with that language. The organizers admitted that at a short notice this was a tall order, especially to someone coming from outside the Hindi heartland. I agreed to the request saying that my early education in Banaras made me also one of them and I would be happy to try. When I began my talk with the opening address “Deviyon aur Sajjanon” instead of “Ladies and Gentlemen” I saw a wave of relief travel through the audience and there was a spontaneous applause. I was surprised myself how effortlessly I could convey my topic to the audience in a language that I had not spoken for over two decades.

In the late 1970s I was invited to Nanded to deliver the Narahar Kurundkar Lecture Series, established to commemorate a great intellectual of that name from Nanded, who had passed away a few years earlier. I was to

deliver three lectures on consecutive days. They were arranged in a big auditorium, which, however, was overflowing on the first evening. The organizers were requested by many to shift the venue of the following lectures to an open air setting where larger number of people could be accommodated. However, they opted to continue with the existing venue on the grounds that most people might have come to 'see' the speaker, and as found in other lecture series, their number would decline for the subsequent lectures. However, this calculation turned out to be wrong and the crowd that turned up for the second day was even larger. Police had to be called to bring control and many people who could not be accommodated got rightly annoyed. So the organizers announced that the third and last lecture would be held in an open air venue. That final lecture had a crowd estimated at around 10,000.

These instances show that the common man is interested in knowing more about science and needs to be suitably enlightened. There is a great need for science popularizers in various scientific subjects, who can convey the basic facts and the excitement about science without burdening the listener with heavy jargon.

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In 1976 I received a letter from Dr Karan Singh in his capacity as the Secretary of the Jawaharlal Nehru Memorial Fund in New Delhi, inviting me to deliver the 1976 Jawaharlal Nehru Memorial Lecture. The JNMF had earlier awarded me the prestigious Jawaharlal Nehru Fellowship for the period 1973-75. The Lecture organized by the Fund was also a distinguished one, usually given by an intellectual from abroad. It was therefore a great honour for me to be invited.

At the time I was getting concerned with the way superstitions were dominating the Indian society at all levels. Whether literate or not, poor or rich, belonging to any profession, the typical Indian mind was wrapped up in traditional superstitions and rituals that held no significance in the modern times. So, when I was asked to inform the JNMF the topic of my talk I elected to speak on *The Scientific Outlook*.

The lecture was scheduled to be held on November 14, Nehru's birthday and was to be chaired by the Fund's Chairperson, who was no less a person than the Prime Minister Indira Gandhi. As it happened, sometime during the preceding weeks, the Indian national Science Academy had organized a special science programme at which the PM was invited to speak, and she spoke on

the need for the scientific temper. Indeed, Nehru himself was a rationalist and had written in his *Discovery of India* about the importance of cultivating the rational outlook that had been embodied in science and its development. Thus I felt that I had picked up a timely topic.

The lecture was organized in a public auditorium and was filled to capacity. Dr Karan Singh made the introductory remarks and I was then invited to speak. My talk was about how the scientific outlook evolved with science but now really transcended it. I discussed the need for every citizen cultivating this outlook, regardless of whether he or she was a scientist or not. Recalling Nehru's hopes expressed in the early 1940s that once the nation became free from bondage, its citizens would start shedding age old superstitions and thinking rationally, I drew attention to the existing situation that even in the third decade of independence, there had been no progress towards that hope. As an astronomer, I was particularly scathing about astrology, and its dominating role in the society. I also touched upon other superstitions like running after the so-called holy men claiming to perform miracles. Mrs Gandhi seemed to be in tune with what I was saying and often nodded in agreement. She did not, however, make any remarks from the chair after the talk. The meeting simply concluded after my talk, although afterwards she said that she had enjoyed the lecture.

I was to spend another day in Delhi as guest of JNMF and this included a visit to a programme at the Teen Murti Bhavan, which had been the residence of Nehru as nation's first Prime Minister. I met several dignitaries from Delhi on that occasion. One youngish person dressed smartly in a suit accosted me and said that he enjoyed my talk the previous day and shared my concerns. When asked what was his profession, he said that he belonged to the security of the PM. He disclosed that in my talk, the first three rows were occupied by security personnel. Then it came home to me that we were in rather unusual times. The country was under a state of emergency and there was a strong perception of threat to the life of the Prime Minister.

I had written a letter to the PM in which I had stressed the need for greater funding for science, especially more opportunities for Indian scientists to travel abroad for collaborative programmes, conferences, etc. After joining the Tata Institute, I had seen a progressive reduction in the foreign travel budget in real terms and therefore a more liberal attitude from the Government of India was requested. Despite the ever-present issue of shortage of foreign exchange, aggravated by the rise in petrol prices, I felt that the liberalization I was requesting was a small burden on the national kitty, yet it would produce

a see-change in the productivity of scientists. I had requested time for a courtesy call on the PM when I intended to present my letter to her.

I was granted time to meet her in her office in the Parliament building. It was a simply furnished office, but it had a radio constantly on in low tones. I was told that she was able to listen to the debates going on in the Lok Sabha and the Rajya Sabha through this medium so that if needed she could intervene. After saying a few remarks in which she once again referred to my talk in complimentary terms, She asked me how I was getting on with my work. I then produced my letter. She went through it, underlining with pencil those statements that she considered important. She seemed to appreciate my point of view and said that she would try to help.

I came from the meeting satisfied, although I did not expect any dramatic action. But the situation was that the foreign travel budget at TIFR did increase in the coming years, although she herself was not in power during 1977-80.

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The Jawaharlal Nehru Memorial Lecture was in a sense the beginning for my personal campaign for the scientific temper. There are several aspects of daily life in India when the need for this attribute is sorely felt.

No one who has spent some time in India can fail to see how deep the impact of astrology has been on the human mind. The influence of planets on human life is assumed as a fact, even though there has been no scientific demonstration of it and despite the failure of astrological predictions to pass controlled tests. The belief is spread amongst all strata of life as I have mentioned earlier. I have spoken on public platforms, written in various print media, used TV and radio debunking astrology, and continue to do so even today. For, it is a campaign that will take long to win, yet win one must for the welfare of India and the Indians. Irrational beliefs and crucial decision making based on them will be ill-affordable in the increasingly competitive world that we have to live in. In short, one cannot afford one's superstitions.

Beliefs in godmen of various brands also abound in our country. Let me clarify at the outset that we have a rich and valuable heritage of philosophical wisdom and excellent advice on enriching one's self. Different thinkers from various religions have written thoughts that serve as useful guides. But in contrast to this real greatness there is plenty of pseudo-greatness around and its purpose seems to be to serve personal gains at the cost of the gullible. The typical pseudo-great person of this type would like to perform 'miracles' to impress

those present with his or her ‘supernatural powers’. These miracles look like magic and are in fact no different from the tricks that magicians perform. Some voluntary organizations have demonstrated the secret behind such tricks, such as simple sleight of hand, use of subtle chemical reactions or clever applications of laws of physics. Yet we have a continuing supply of these godmen. In some cases they manage to impress and influence important politicians too.

Besides these, there are numerous rituals and practices that are followed today without thinking as to whether they are needed or whether they are relevant. Large amount of money and valuable time are spent on them. Energy which could have been employed in constructive work is wasted in them. In some cases as in the notorious ‘sattee’ ritual they involve innocent human life. Cases of psychological breakdown that need to be treated by modern scientific methods are sought to be treated through unconfirmed beliefs. The ultimate decision in the matter of abandoning such beliefs has to be taken with a full appreciation of what is involved. After telling the wisdom of Bhagavadgeeta to Arjuna, Lord Krishna urges him: “Think over it all and then do as you wish.”

## THE NEHRU PLANETARIUM

**I**N August 1975, a faculty colleague in TIFR, Balu Venkataraman, who was professor of Chemical Physics, dropped in to see me with a rather unusual request from an unexpected source. Balu's message was this: There was a move to establish a large planetarium in Bombay; would I help by heading its programme committee? The request came from Rajni Patel, who was a leading (arguably the most influential) Congress politician in Bombay. How come Rajnibhai, as he was often referred to, got interested in a planetarium?

Balu explained that Mr P.J. Patel, a leading businessman in Bombay who dealt in optical instruments and gadgets, had imported a large planetarium projector from Carl Zeiss, in the then East Germany. The planetarium projector had arrived but had got stuck in the port of Bombay for customs clearance. There was heavy duty to pay unless the planetarium could be shown to have usage for educational purpose. In this case, Rajnibhai was approached. He already had a proposal for establishing a cultural and scientific centre in Bombay under a trust called the Nehru Centre. If P.J. Patel would donate the planetarium to the Nehru Centre, it could be run as a non-profit educational instrument. Some such agreement was indeed worked out and the planetarium projector was released duty-free.

The ball was now in Rajnibhai's court. He already had acquired prime land in the central part of Bombay, near Worli Naka and had a distinguished architect, Mr Kadri to plan the Centre's buildings. There were to be two main buildings: a large skyscraper-based building to be called the Discovery of India

Building, and another smaller one for the planetarium. The latter was to be completed first since the instrument had already landed. As the project was entirely new...the only other major planetarium was in Calcutta...the programme committee was to decide its function and layout, providing inputs to the architect as well as to the Managing Committee of the Nehru Centre Trust. Mr Sukthankar, a retired Chief Secretary of the Government of Maharashtra was appointed the Chief Executive of the Nehru Centre. He would deal with the day-to-day issues of the centre, largely to do with administration and finance.

This kind of enterprise was new to me also and I wondered in what way I could be of any use. My first inclination was to say 'No' to the request, but Balu and Rajnibhai persuaded me to take up the assignment. The latter promised all help from the Managing Committee. And he kept his word.

The Programme Committee had three TIFR scientists, Kumar Chitre and Balu besides myself. There were some from the Nehru Centre and from other institutions. Our brief was to provide all the scientific inputs to make the planetarium function properly. We were told that the planetarium would be installed within a year and there should be a good opening programme to grace the inaugural function. Rajnibhai had in mind the Prime Minister to come for performing the inauguration.

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We felt that at least in the early days of the planetarium, we should have a distinguished astronomer interested in public outreach, as director. After looking around, we homed in on one name, of Arvind Bhatnagar, a solar physicist who had just set up a solar telescope in a lake in Udaipur under the auspices of an NGO called the *Vedhashala*. We had a talk with him and he agreed to come on an extended leave from his parent organization.

I recall, bringing Arvind to meet Rajnibhai. Kumar Chitre and Balu Venkataraman were also with me. We went up to Rajnibhai's office in an apartment in one of the newly erected skyscrapers in Backbay Reclamation area along the Cuffe Parade. After initial discussions Arvind raised the all important question of accommodation. For, Bombay was (and still is) notorious regarding availability of living accommodation. By way of reply, Rajnibhai opened one of the drawers in his desk and took out a bunch of keys. "Here are the keys of the apartment in this same complex of buildings. Go and have a look to see if it is suitable." I am sure Arvind was taken aback as we were by

this ready response. We went to look at the apartment which was spacious by Bombay standards and commanded a good view from its sixteenth floor location. I am sure the apartment was one major reason in swaying Arvind to decide to join the Nehru Centre. He was also assured that he would be permitted to spend part of his time on his ongoing research.

Arvind's appointment certainly gave a boost to the project. As director he was convener of the programme committee and handled the day-to-day issues which grew in magnitude as the building construction proceeded. There were the inevitable clashes with the architect where the architectural angle differed from what was needed best from functional point of view. In such cases Rajnibhai would have to mediate. But already I was seeing the conflict between the administration and the director with the programme committee having to act as the buffer. Rajnibhai's brother in law (sister's husband) Mr Shyam also helped in such cases.

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There were several operations needed for reaching completion in the autumn of 1976. Not the least was money! Nehru Centre got an exemption from paying entertainment tax to the Government of Maharashtra by agreeing to have two morning shows free for children from the municipal schools. Taking this into consideration, the ticket price was reduced to Rs 5/- with the expectation that it would attract more of the middle class viewer who would normally opt to see a Bollywood movie. Some of us still thought the price too high, but went along with the decision. In the end, the viewer response did justify the price fixed.

However, that was a matter concerning revenue earned after the planetarium got going. What about the capital costs? Rajnibhai was known to be an excellent fundraiser and his party valued him as such. I got a glimpse of how he managed this feat. At one meeting he announced that he had raised Rs 20 lakhs for the planetarium by persuading the Hyderabad Race Course to donate all its earnings on the last racing Sunday! Moreover, he also got income tax exemption for this donation as it was for the trust.

Although we were mainly concerned with the planetarium programme, all of us on the programme committee felt that there should be dynamic exhibits to illustrate some of the results in astronomy. To have such models, we invited Mr Beri who was in charge of the science museum at the Birla Institute at Pilani. He had several discussions with us and we had his guidance in making a series of excellent models for display. An Orrery constructed by the engineers

from the Bhabha Atomic Research Centre, dominated the main foyer. That is we had a model of the Sun and its planets moving round it, hanging from the ceiling. There was a model of the lunar landscape, a weighing scale that told you your weight on planets, a Mars panorama, etc. The expectation was that apart from the 40-minute planetarium show, the viewers would spend another 40-45 minutes with these interactive models.

As the building began to take shape, we had to worry about the installation of the projector which had been sitting idly in packages. The engineers from Carl Zeiss were consulted and invited for this process as well as for inputs on how the dome should be built. We had also to choose the reclining chairs that tilted so that the viewer naturally looked 'up' rather than in front as in a movie. As a planetarium for 600 people, this was the largest in the range: indeed all later models have since been geared for a capacity between 50-200. Nevertheless, for a city like Bombay, the large capacity was quite suitable. There were minor hiccups in all these steps, which Arvind as Director had to sort out. However, he had the full backing of our committee.

In the middle of 1976, I was invited by Rajnibhai to a discussion. He requested me to write to Prime Minister Indira Gandhi requesting her to come to Bombay to inaugurate the new planetarium in the autumn. I was surprised and asked: "Should you not yourself write, both as a trustee of the Nehru Centre and as one who knew her for many years?" I felt that his words would carry greater weight with the PM than mine. He smiled and said that he felt the opposite, that she would be more sympathetic to an invitation from a scientist like me. Perhaps I was being politically naïve! For I later learnt that in the aftermath of the Emergency, there had been a growing disagreement between her and Rajnibhai, the latter not being sympathetic to the high-handedness of Sanjay Gandhi. Anyway, I wrote and later learnt that the PM had consented to come and inaugurate the planetarium, which was to be called the *Nehru Planetarium*.

We now had to worry about the programme which was to do justice to the occasion. We finally scripted one which was called *A Tryst with Destiny*, a title suggested from Jawaharlal Nehru's speech on the occasion when India received its independence from the British rulers. Indeed the script of the programme provided a nice blend of Nehru's thoughts and vision, the ambience of Bombay and the special views of the sky above. Who would be the commentator for the occasion? Rather than look for a commercial voice, we persuaded Kumar Chitre to do the honours. He was naturally hesitant as to his capacity to fulfill our expectations, but Rajnibhai persuaded him to accept the

assignment for that special occasion. He had the famous actor Dileep Kumar to coach him on diction for the commentary!

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With all preparations complete, we were now counting the days to the inauguration date which was set as 12 December, 1976. The PM was to come down from Delhi to inaugurate and Mr Ali Yavar Jang, the Governor of Maharashtra was to preside. Unfortunately, events did not go as planned.

In December, the Governor had a heart attack and was kept in the intensive care unit with a pacemaker. But he did not survive and passed away the day before the inauguration. At the suggestion of the Prime Minister, the inaugural ceremony was cancelled, or indefinitely postponed. While all of us were disappointed, we could see the logic of the decision taken to mark respect to the departed soul.

Afterwards, a few weeks later, I was asked to write again to the Prime Minister to come for the postponed inauguration. She gave a date in March. She came and inaugurated the Planetarium in a well organized ceremony. However, I had to miss the occasion, since I was then on a semester visit to the University of Texas at Austin. When I was informed by cable that the event did take place as planned, I addressed a letter to India Gandhi as Prime Minister of India, thanking her for coming down to inaugurate the planetarium.

In an ironic twist to the events, I learnt after posting my letter that she was no longer the Prime Minister! In a dramatic general election, the Indian electorate expressed its views in no uncertain terms on the state of emergency that had been proclaimed in 1975 and the draconian measures taken to suppress personal and public liberties. India Gandhi lost her seat in the parliament, her party lost the election and a new regime came in place.

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So far as the planetarium was concerned, it went from strength to strength. It has now occupied a place of attraction and honour amongst the sights and events of Bombay. It has screened some excellent programmes and has supplemented its menu with public lectures, classes for introducing public to astronomy, night sky-viewing and special viewing sessions on occasions like eclipses, occultations, transits, etc. Although after leaving Bombay, my contact with the Planetarium was greatly reduced I do enjoy visiting it and delivering a public lecture under its roof.

## WORKING IN TIFR

I was in TIFR from October 1972 till the end of May, 1989, two hundred months in all. In this chapter I will look back on my working environment during that period. Let me at the outset say that TIFR fulfilled the expectations I had about the institution when I joined it after ending my fifteen year sojourn at Cambridge. Despite occasional instances of disappointment, frustration and anger, that are inevitable in a long association with an academic institution, I never regretted my decision of coming back. My interaction with academic colleagues was for ever on amiable terms. If there were any local politics or intrigues, I was never part of it. My dealings with TIFR administration had all along been on friendly terms, and I always had the feeling that the infrastructure staff liked and respected me as a human being.

I begin my review of TIFR years with the early period when M.G.K. (Goku) Menon was the Director. It was he who had written the letter inviting me to join TIFR and who had facilitated all the joining arrangements like accommodation, payment of passage, arranging for an office assistant, etc. I had met him a couple of times before joining, during my earlier visits to India. He had asked me to be on 'first name' basis with him, which was then unusual in an Indian institution. This informality of his also showed in his conduct of the physics faculty meetings which he chaired whenever he was in Bombay. The custom (dating back to the Founder's time) was that after the faculty meeting (which was on a Wednesday), there was a lunch which was usually attended by most faculty members. The meeting may have been approximately

once a month, but the lunch was every Wednesday. Goku attended the lunch regularly whenever he was in residence. The menu had a western touch and the lunch was a sit-down affair with service as per proper Western protocol again, a tradition carried on since Bhabha. In later years the menu changed to the Indian pattern and lunch became a buffet affair. I for one regretted this change.

I often found the faculty meetings, whether chaired by Goku or Roy Daniel as the Dean, long drawn out affairs with members speaking at length. I carried the impression that some intervention from the Chair could have streamlined the affair. But, possibly the chairman believed that letting the members get off the steam would make them feel comfortable! I rarely spoke in the meeting unless there was an item that I really felt the urge to speak on. There were occasions when I felt that the item under discussion could have been settled at a lower stage and need not have come to the PF.

In 1971, Goku had been entrusted with the additional responsibility of Chairmanship of the newly set up Electronics Commission. He was also required to be the Secretary to the Government of India in the Department of Electronics. The creation of a new department indicated the importance the GOI attached to the newly emerging electronic technology. Thus Goku was expected to give a boost to the emerging technology and encourage the industry to take up the challenges and opportunities presented by it. The expectation was that India, with its strong scientific base would take off fast in the growing electronics age. Goku's appointment signified how strong the Government if India wanted India's electronics activity to grow.

The judgement of hindsight has to be that this step did not succeed. Despite great know-how and scientific expertise in the country, India failed to take advantage of this new development. The 'Permit Raj' took over to ensure that every new enterprise ended up tied in bureaucratic knots. Even a scientist of the stature of M.G.K. Menon could not extricate those knots or set a new pattern. Nations like Japan and later Korea, Taiwan and others took advantage of the electronics technology to produce industrial revolutions in their economies.

The consequence for TIFR of this step was nothing short of disastrous. Goku could no longer devote full attention to its development for the very good reason that one cannot be in two places at the same time. To make matters worse, he took on additional responsibilities such as chairing the boards of the Electronics Corporation of India Limited (ECIL) in Hyderabad, the Physical Research Laboratory (PRL), Ahmedabad, the Indian Institute of Astrophysics

(IIA) in Bangalore, etc. Bombay became a transit halt for him like Bangalore, Hyderabad, Delhi, and other places in India. The administration of the Institute fell effectively on the shoulders of the Deans of the Schools of Mathematics and Physics, more on the latter as this was a much bigger and diverse system. There were occasions when Roy Daniel had to travel to the Bombay airport with files for Goku's signatures as he transited through from Bangalore to Delhi or the other way round. A common question asked in TIFR was: How many hats can a man wear at the same time?

The situation reached a climax, when late in 1974 Goku was asked to become the Science Advisor to the Department of Defence. This job required him to be in Delhi most of the time. The question was, would he manage to don this extra hat without relinquishing any he held already. Despite wishing to do the same Goku realized that as per the GOI rules, he could not and took the decision of relinquishing the directorship of TIFR. I will return to this story later in this chapter.

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The School of Physics was divided into smaller groups each headed by some senior faculty member. The word 'Head' was not used, however, for the possible reason that the group-structure was considered to be informal, which it was not. The designation in favour was 'In Charge'. Before I joined, the Theoretical Astrophysics (TAP) Group had been part of the Theory Group or the Theoretical Physics Group. Thus the expectation was that with my joining, astronomy and astrophysics at TIFR would have a strong theory base. I should mention that arising from the original cosmic ray group, there was a large contingent at TIFR specializing in solar cosmic rays (in charge, Sukumar Biswas), infrared astronomy (in charge, Roy Daniel) and x-ray astronomy (in charge, B.V. Sreekantan). The group under D. Lal with geophysical aspects of cosmic rays was shortly to move to PRL, Ahmedabad, as Lal had been appointed Director of the Physical Research Laboratory to succeed Vikram Sarabhai, who had suddenly passed away in 1971.

In the newly constituted TAP group, my colleagues were Mahendra Singh Vardya (Associate Professor), Shashikumar Chitre (Fellow), K.S. Krishna Swamy (Fellow), S. P. Tarafdar (Research Associate) and S. Ramadurai (Research Associate). There were research students also: Pushpa Joshi was working with Vardya, while Gadre and Kale were working with Chitre. P.K. Das, who had completed his graduate school requirements was assigned to me as a research

student later on, followed by Ajit Kembhavi. We also had a visiting fellow, S.K. Shah, who later joined the Indian Institute of Astrophysics (IIA).

The TAP group had a weekly seminar activity in the form of a ‘Journal Club’ every Tuesday afternoon at 2.30 p.m. This had been initiated by Vardya before I had joined. In this activity, someone or other in the group would read and explain a recently published paper which would then be discussed by the group. I introduced a weekly lunch to precede this activity. All of us would meet in the West Canteen together at 12.30 and sit for lunch at the same table. In addition there were more formal astronomy seminars where the TAP group would participate along with other astronomy related groups mentioned before.

The graduate school had several courses which were to be attended and passed by the new research scholars before they could be assigned to any research guide. I was asked to give a course on general relativity and cosmology, which was quite popular, since apart from the new research scholars, senior ones as well as some staff members also sat for the lectures. For my end of the term test I recall setting a take home paper with 168 hours (one week) duration. The student could look at their notes or books but were not permitted to consult amongst one another!

The year I joined (1972), TIFR had organized a series of popular lectures for the general public to be delivered in the Homi Bhabha Auditorium. The organizer was P.V. Ramana Murthy from the x-ray (and gamma ray) astronomy group. He approached me to deliver the first lecture in the series. I asked, why a newcomer was being approached...would it not be appropriate for the Director himself to launch the series with his lecture? My lecture would then be the second one in the series. He hummed and hawed and said that he felt that the series should be set off by me as my name was popularly known! Perhaps another reason, which he did not state was that it would be difficult to find the Director in Bombay to give the talk.

Anyway, the series was announced and my lecture was scheduled first. Contrary to my apprehensions as to whether the 1000-capacity hall would look too empty, that evening the auditorium was packed. I spoke on the Nature of the Universe, illustrated with slides. The Director being out of station I was introduced by Roy Daniel. Ramana Murthy was right in his expectations since the hall was less than half full for subsequent lectures in the series by other scientists.

During my early years at TIFR, I overlapped with Anant, my brother. He had just left the senior post he held at Shivaji University, Kolhapur because of a serious disagreement with the Vice-Chancellor. From being Professor and Head of Department there, he preferred to be a reader at TIFR. His speciality was condensed matter physics, an area in which TIFR had good facilities. So research-wise it was better for him to come to TIFR even for a lower post. He had a flat in the same B1-Block that I had and so we could see each other frequently. It was during this period (December 1973) that he and Aruna had a baby daughter, Amruta.

All of us had an enjoyable visit to Sagar where Aruna's parents, the Bhawalkar family lived. We attended the naming ceremony of the child. We were also treated to lavish hospitality by the Pimpalapure family who lived across the road. Mr Pimpalapure (Baburao) had a flourishing business producing the *beedies*, that is, the local brand of cigarettes. Mrs Pimpalapure is Aruna's eldest sister. With their help we could visit the old remains at Khajuraho.

Anant was later invited by the Director of the National Physical Laboratory, New Delhi, Dr Ajit Ram Verma, to a higher post there and he moved to Delhi in 1974. We of course missed him in Bombay, but could look forward to a hospitable place whenever we visited Delhi. Verma had been Anant's Ph.D. supervisor in B.H.U. before Anant moved to Cambridge to work in the Goldsmith's Labs.

Anant did not immediately have a suitable staff quarter when he joined NPL and so he rented a flat in a nearby residential locality known as the New Rajinder Nagar. His landlord was Dr Arora, a medical practitioner. Both Dr and Mrs Arora were a friendly couple and welcomed the "three A's" from Bombay. Aruna is a talented artist and held several exhibitions of her paintings both in Delhi and in Bombay.

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As I mentioned earlier, I gave a graduate level course in TIFR during my first year. I continued to give a course in subsequent years whenever the Graduate School Committee requested me to do so. Thus I gave courses on relativity, cosmology, high energy astrophysics, as well as some special advanced courses. However, I noticed that several of my colleagues on the PF shied away from teaching. They considered it either a waste of their time that could be better channeled towards research (-although there was no manifestation of exceptional research coming from these stalwarts-), or felt that graduate courses were not

necessary for the general development of the graduate student. I would not have minded these attitudes if it were not the case that some of them seemed to imply that those who did get involved in teaching were past doing research.

Whatever be the motivation for avoiding teaching, I think it reflects badly on the ambience of the research institute. I had seen great figures like Dirac, Hoyle, Mott, in Cambridge, Feynman and Gellmann in Caltech, John Wheeler in Texas lecture to undergraduates and graduate students. The impact of learning from such high achievers can be immense and to denigrate teaching and the teacher is being extremely shortsighted.

I had been warned by several ‘wellwishers’ against the politics in Indian academic institutions, from which even TIFR could not remain immune. Such arguments did not influence me, since I have yet to see an academic institution that does not have undercurrents of politics. It was politics at Cambridge that drove Fred Hoyle away from a well established post. My visits to other venerable institutions like Caltech or the University of Maryland in the USA or Institut d’Astrophysique in Paris had been short but still long enough to acquaint me with such undercurrents. Human aspirations for power and glory transcend all types ranging from the mediocre to the excellent. So I did not expect to find absence of politics in TIFR. But I did my best to keep myself aloof from political maneuverings.

In an academic institution these currents arise in different ways. Dr X is disgruntled because he was not promoted whereas his colleague DR Y with fewer achievements (in X’s view, of course), was. Professor U is unhappy because the Institute did not depute him abroad whereas Professor V was. And so on and so forth. Such feelings existed in TIFR and surfaced during canteen talk, for example. Since I did not engage in such talk, I would often be the last person to be aware of some ‘juicy’ tale or a ‘shocking’ development!

Nevertheless, I had to attend several meetings to decide promotions of junior staff and I felt that despite the enlightened guidelines laid down by the Founder, my colleagues spent immense amounts of time to come to a conclusion. Data on the candidate could be ‘interpreted’ to suit the point of view of the speaker. Thus if the candidate had a short publication list his supporter would argue that he was very discerning and self critical and did not publish his work unless it was really excellent. His denigrator would argue that the shortness of the list showed that the candidate was no longer productive. Likewise a long publication list would be a ‘strong proof of productivity’ if you were in favour of promotion and ‘a tendency to publish indiscriminately’ if

you were against it. I always returned from these meetings wondering about the so-called objectivity of scientists.

Another aspect I missed in TIFR was external evaluation of the institute by experts in their fields. The Institute did not have a scientific advisory committee made of outside scientists to express views on the overall quality of its research, its future programmes and the competence of its scientists. The feeling that 'we are mature enough and do not need outsiders to tell us what to do' was predominant collectively amongst its senior staff members. Not surprisingly, many years after I left TIFR, there were developments that forced the Management Council to appoint a scientific review committee of outside experts to evaluate TIFR and the committee came up with recommendations for drastic reform including the non-renewal of the term of the Director.

There were internal meetings to discuss programmes at various levels, of course. These were often induced by the missives from the Government of India through the DAE, to send the financial estimates for the 'plan' and 'non-plan' budgets for the following five years for inclusion in the next five year plan. While there would be discussion on the relative merits of two competing proposals, very rarely did we look backward to see how much of the proposed objectives of the previous proposals were in fact met. If Professor X had spent so many millions of rupees in the previous plan, it was assumed that he was qualified to spend twice that amount in the next plan. Although this may sound too simplistic an argument, this more or less summarizes the logic of proposals for 'plan' budget.

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Against this background, it may be worth narrating my own experiences at TIFR. I will limit myself to two instances, one relating to my nomination to the Shanti Swarup Bhatnagar (SSB) Award and the other to my promotion.

The SSB award is a prestigious one, given to scientists in various disciplines and below the age of 45. The emphasis is on work done in India. I recall being asked by several of my colleagues as to why I had not been nominated for the award. I used to reply that I did not know why, but could hazard a reason that for the award my work done in the UK (prior to 1972) would not count and that I should wait until my work done in TIFR became substantial enough to merit the award.

In 1976 I was visiting B.H.U. where I ran into Professor Kanungo, a biologist, who said that it was high time I was nominated for the SSB award.

He said that he will do so himself and asked me to send him my biodata and other supporting material needed for the nomination. I did so with some hesitation, since I felt that the right person to nominate me would be the Director of TIFR. I did not hear from Prof. Kanungo for a few weeks, when he sent me a letter stating that as he was made one of the jury members of the award, he could not send any nominations himself. He also mentioned that he had talked to Dr Raja Ramanna, the Director of BARC and Head of DAE, about my nomination and Ramanna had assured him that he would be very happy to nominate me.

I forgot about the matter until I received a phone call from Raja Ramanna. He mentioned that he had agreed to nominate me for the SSB award, but felt that Dr Sreekantan, as Director of my institute should really do it and that he would speak to Sreekantan. I felt rather embarrassed by all this since I would never have approached Sreekantan (or anybody else) to nominate me. Now it might appear that I was bringing pressure from outsiders for Sreekantan to nominate me. Indeed it is the Director's prerogative to assess which of his staff members to nominate at any given time. What if Sreekantan had another candidate in mind? Although Ramanna as the Head of the agency (DAE) supporting TIFR would be expected to have his request honoured, I did not like the nomination to come this way.

However, the matter was now out of my hands. Sure enough, Sreekantan called me the next day and said (without reference to any communication from Ramanna) that he had decided to nominate me for the SSB award and could I give him all the relevant material for my nomination? I thanked him and sent him the necessary material.

That nomination succeeded and I was awarded the SSB award for physical sciences for the year 1978, jointly with E.S. Rajagopal. I was of course honoured and happy to receive it, although there was a nagging thought in my mind: Was the value of my work better appreciated outside TIFR than within it? Why was it that two senior scientists outside TIFR thought of nominating me rather than the Director?

The feeling was also growing in my mind that despite spending several years at TIFR, I had not yet received a promotion. When I had joined TIFR, Menon had appointed me at the top of the scale of Full Professor. The next higher grade (and the highest for academic members at TIFR) was that of the Senior Professor and I expected to be promoted within 3-4 years at the latest. However, soon after joining, the 4<sup>th</sup> Pay Commission of the Government of India had intervened and refixed the scales of pay as well as placement in the

pay-scale itself in such a way that I found myself at the bottom of the Full Professor's scale! I raised a mild protest: but the financial experts explained the logic (such as it was!) of the decision which was dictated by the economics of the pay-fixation process. In fact my pay in the new scale had been *below* the pay I was receiving till then and so a 'personal' pay had to be added to raise the pay to the original level. Thus I had gained nothing by the new pay fixation and now had a whole scale to climb over.

In the meantime, all through the 1970s, I had been steadily acquiring greater recognition of my work in research as well as science popularization. These included the Bhatnagar Award mentioned above, fellowships of the national science academies (the IASc in Bangalore and INSA in Delhi), the Jawaharlal Nehru Fellowship, short term visiting positions in prestigious institutions in the USA and the UK, etc. Somewhat belatedly, in 1981, I received a 'half' promotion, which involved being placed in the upper half of the Full Professor scale. It was only in 1983, eleven years after joining TIFR that I was promoted to senior professorship. Although my own interaction with the Director Sreekantan had been most cordial and friendly, this lack of internal appreciation amidst growing distinction in the outside world made me wonder why. The only conclusion I could draw was that in the TIFR council, there may be some resistance towards my advancement in the institute. I was to discover the reason only in 1987.

I should mention that these symptomatic incidents did not take away my overall satisfaction of working in TIFR. Nor did I ever have to complain against any peer-animosity. My intercourse with all the academic members in TIFR continued to be very friendly. So far as the infrastructure staff was concerned, there too I was receiving greater and greater affection and respect. From the Registrar to the watchman at the gate or driver of a staff car or bus, I used to receive and reciprocate smiling greetings whenever our paths crossed.

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Being in one place for over fifteen years you do not easily notice the changes taking place in the system slowly but surely. In TIFR a subtle but steady trend towards bureaucratization was taking place over the period 1972-89 that I was there. In Bhabha's time, the Founder's personal prestige had been sufficient to combat trends towards mediocrity. The personal attention that Bhabha paid to fine details like cleanliness, dress code, aesthetics, etc. had ensured that the institute would retain a unique status amongst all the academic institutions in

the country. This was indeed so during Bhabha's lifetime and by the law of inertia, it continued to be so for around a decade or so.

However, gradually the momentum was lost. Either for want of time or urge, the later directors did not pay attention to these details to the extent they demanded. Some items were delegated to underlings. While this may appear to solve the problem, things do not get the attention they deserve unless the top person is seen to be interested. So old timers visiting the institute after ten years would often remark what we regular residents had failed to notice: that the institute did not look the same as before.

But even more seriously, one could notice internally the growing level of bureaucracy and the increasing interference in the running of the institute from the DAE officials. Almost every day would come some missive or other asking the institute to implement this or that. Sometimes it would be asked as to who was running the institute...the DAE or the Director? Although technically the TIFR was created as an 'autonomous institution', its autonomy was getting progressively eroded.

An example of how the DAE influence on day to day running of TIFR was growing, is seen in the construction of the D-Block, which was completed in the 1980s. The structure had to blend with the original building and this required an external tiling to match the existing exterior. However, the DAE rules did not allow this 'higher specification'. So by way of compromise, the front face of the new block was tiled to match, leaving the rest to the rather shoddy but 'as per rules' appearance. Likewise, the guest house building Ramanujan was so shoddily built that the institute had to get several things redone. The result is passable but hardly one that Bhabha would have tolerated.

The 'Government rules' thus began to replace the internal functioning of the institution. While on the face of it one could argue that if you are receiving government fund, you should abide by the government rules, one could read between lines and take advantages of ambiguities of wording to get a deal that permits the institution to function more smoothly. The director has to take a firm stand in such cases. As this did not happen, there was a steady take over of the original system by the governmental bureaucracy.

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There were nevertheless opportunities to achieve improvements within the system if one went about it the right way. I give a few instances in which I could improve upon the existing system, although in a minor way.

The TAP group had been steadily built up over the years into a bunch of enthusiastic bright young men which included people like Ajit Kembhavi, H.M. Antia, N.C. Rana, T. Padmanabhan, Alak Ray, Pankaj Joshi and other post docs who joined the group from time to time. Although Vardya, Chitre, Swamy and I had rooms on the fourth floor, the others were scattered in offices on lower floors. This meant we did not have a feeling of being part of a close-knit system. As there was always a crunch for space, and staff members were reluctant to change their offices, it was almost impossible to propose a rearrangement of offices that would bring all of us together.

However, in the 1980s, the creation of the D-Block generated a lot more office space. At that time the institute decided to have a major overhaul of office distribution, A 'space commission' was appointed to look into the office and lab requirements of various groups. At that time I made a strong case for bringing our group together. This was accepted 'at a price'. We could all move to the second floor towards the west end. There we could have the number of offices that I had asked for. The price to be paid was for the four of us to come down two floors. I readily agreed, as did Chitre and Swamy. Vardya, however, wished to remain where he was.

This relocation made it possible for us not only to have adequate office space for all staff members, but also space for post-docs, students and occasional visitors. My own office was bigger in size than on the fourth floor and was connected to the room where Joseph and other support staff sat. By then we had another secretary and also an attendant S.R. Tarphe. They were next door and this was a great convenience to me. Not only that but we also had a double office which I converted into a seminar room for the group's seminar. This seminar room was a great success. In fact much later, after I had left, an important visiting committee constituted to look into the functioning of TIFR, met for its deliberations and interviews of staff members, in this very room.

Another example that I can cite comes from my chairmanship of Group Committee II. The academic spectrum of the School of Physics was divided into several group committees. Each committee included senior members of groups with somewhat similar interests. Thus the TAP group was part of a group committee that included groups dealing with space astronomy, cosmic rays, etc. Each group committee dealt with administrative matters and made recommendations for the Physics Faculty as a whole to consider. One sticky item for each group committee was whom to depute to conferences held abroad. Limited funds made it impossible to meet the demands of all, well justified

though they might seem. Whatever decision was made seemed to leave a few disgruntled souls behind.

To deal with the matter, I made an evaluation system of points which included several criteria for evaluating each proposal. Was the person giving an invited talk at a prestigious meeting? Or was he contributing a paper or a poster paper? Higher point-rating was given for the former than for the latter. Had the member been deputed during the last three years? If so, he lost a few points. Did he get support of local hospitality? If yes, he had a plus point. And so on. The criteria were entirely objective and transparent. So each proposal was quickly evaluated without dispute and one could prepare a priority list according to the points earned. This system was followed by the Group Committee II even after I had left TIFR.

Another system I introduced while Chairman of Group Committee II was of writing minutes soon after the meeting was concluded. I used to write the framework of minutes beforehand, leaving a gap for the actual decisions taken. These gaps were quickly filled after the meeting was over. In fact I used to request the members to remain for five minutes while I completed the minutes so that I could get their signatures. My colleagues used to joke that I wrote the full minutes of the meeting before it took place!

## SOME MEMORABLE OCCASIONS

I spent over sixteen years of my career as staff member of TIFR, a period that saw me change over from a youth to a middle aged person. There were several events that I like to look back on during this period and here is a subset of them.

One fine morning in 1983, I received a telephone call. Sunitabai Deshpande was on the line. When I picked up the receiver and identified myself, she greeted me and said "Hearty Congratulations!" I was taken aback and asked : "Thanks, but what for?" She chuckled and said that I would know soon; but asked me to hold on. I did so only to find that the celebrated "Pu La" or P.L. Deshpande was speaking to me. Like his wife, he was mysteriously concise: "Congratulations and our best wishes." Again when I asked for the reason he replied in the same way and hung up.

I did not know what to make of it, until the regional news the same evening on TV told me that I had been selected for the prestigious Rashtrabhushan Award of the FIE Foundation. The award carried a sum of Rs 1 Lakh and was the highest award then bestowed in the state of Maharashtra. I did not even know that I had been nominated for the award. Apparently "P.L." was on the selection committee and wished to congratulate me without letting me know the reason till the news was official.

The award letter from the FIE Foundation arrived in a couple of days. It was signed by Mr Kulkarni, the owner of the FIE industry in Ichalakaranjee near Kolhapur, who was well known for running his industry on model lines. He had set up this award along with several smaller awards which were

given out every year, usually by the Governor of the State of Maharashtra.

I was of course delighted and honoured by this major recognition of my work, both in research and in popularization of science. The award date was duly fixed and all my family accompanied me to Ichalakaranjee. We stayed at the spacious residence of Dr and Mrs Vaze in Tarabai Park, Kolhapur. Mrs Vaze is an aunt of Mangala's and the warm hospitality of the Vaze family has always been a highlight of my visits to Kolhapur since then.

Two rather disturbing incidents occurred during this visit, one before the award ceremony and the other after it. On the day before we drove to Ichalakaeranjee, all of us paid a visit to the famous Mahalakshmi (Ambabai) Temple, Ambabai being our family goddess. The temple was unusually crowded, because a film was being shot there. As we forced our way in, Mangala noticed that her handbag had been forced open. She was holding our two year old daughter Leelavati in her arms and so could not pay as much attention to her handbag as she might otherwise have. On examination it was noticed that some 1000 Rupees that she had just put in the handbag for buying sarees had disappeared.

Rather disturbed, we went into the police station nearby and reported the theft. The police were reassuring stating that they were familiar with this type of theft and generally knew the person or persons behind it. They promised to follow the matter up and let us know. In the end, of course, nothing happened. The irony of it all was that when in the morning we had left the Vaze house for going to the temple, Mangala recalled that she had forgotten to take money for buying sarees and so we had gone back for her to stock her purse!

The award ceremony went off well and I received many accolades from various distinguished persons I met there. The ceremony, however, went off for much longer than we had expected and as I was talking to some local dignitaries after the function was over, Dr Vaze rushed to me and dragged me away to see my father. Apparently he had collapsed with exhaustion and Dr Vaze who knew that he suffered from diabetes, diagnosed his condition as hypothermia, an acute shortage of sugar. He quickly arranged to get some sweet tea which he made my father drink. This revived him soon enough, but I was indeed very glad and relieved that an experienced medical practitioner like Dr Vaze was around when the incident occurred.

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In an earlier chapter, I have described the travels we used to undertake

from Varanasi to Kolhapur and back, to escape the heat of North India during the hot summer months. We used to travel by the Bombay Mail from Moghalsarai to Bombay VT. The long journeys have always held a prominent place in my memory bank. I did not have many opportunities of visiting the B.H.U. when I was staying in Bombay; but whenever a chance presented itself, I tried to grab it. I had even given Varanasi as my 'home town' for the purpose of LTC (Leave Travel Concession) both at TIFR and later in IUCAA, Pune.

In 1980, there was such an opportunity to visit the B.H.U, where I had been invited for a lecture at the National Space Sciences Symposium. Since TIFR has a strong interest in space sciences, several of us decided to attend the meeting. To meet the budgetary constraint, all of us decided to travel by train rather than by air via Delhi. As there existed a direct train from Bombay's Dadar Terminus to Varanasi Cantonment station, we booked our berths in the first class. [The air-conditioned second class did not exist at that time on this train.]

The train left on time and reached Allahabad around an hour late. Thereafter it took the route via Janghai which had a single track rail transport. The train visibly slowed down and had to stop at intermediate stations to wait for the track to clear. Had it left Allahabad at the scheduled time these stoppages would have been minimized. Now travelling at a later hour, the train lost its priority in getting clearance for the route. So it became more and more late and we finally reached Varanasi some three hours late.

It was a pleasure to see some of my old contacts like Ram Suchit Pandey and Chandrama Singh at the station. They brought me to the guest house and saw to it that all arrangements there were working well. The conference itself went well. I enjoyed delivering my talk and was pleased at the audience response. But I also took the opportunity to renew my old contacts with the B.H.U., meeting old teachers and school chums and visiting old haunts. I also visited my school on the campus, which had been elevated to the rank of a Central School and was pleasantly surprised to see that one of the school houses was named after me! It was also a gastronomic feast to visit Ram Suchit at his house where he had personally prepared the delicacies I used to like as a boy.

The four to five days of the scheduled stay were soon over and on January 26, all of us from TIFR were due to travel back on the Varanasi Express. When I mentioned my travel plans to Ram Suchit and Chandrama Singh, they were visibly disturbed. Why? To my question, they replied: "Sir you are travelling on the Republic Day and on that particular day the train travel on that sector tends to get disrupted. They recommended my travelling back by the Bombay

Mail from Moghal Sarai as I used to do in my early days. However, it was too late and bothersome to change the plans at short notice. "Well, I was late coming in by three hours, I am prepared for a similar delay going back." I replied. To which they politely murmured that if the delay was limited to that period then there was no need to worry. Anyway, I could not see why, unless there were an accident on the track the train should be delayed. Also, since it was starting from Varanasi, it was expected to leave on time and so would not have the single-track travel problems faced by it on its onward journey.

And I was very pleased to see on the day of the travel that the train left on time and started with speed. So the fears of my friends from B.H.U. were groundless, after all.

This smug feeling lasted for ten minutes when the train slowed down to a halt. There were crowds on both sides, but this was no railway station. The crowd soon got onto the train. As ours was a first class carriage, there were very few of those on it, but I could imagine that the second class compartments would soon be overflowing. The train started after an unscheduled halt of fifteen minutes and we breathed a sigh of relief. Which lasted for no more than another fifteen minutes. There was another halt, more crowds and some of them now occupying the corridors of our carriage. Also sounds from the roof alerted us that there were quite a few on the roof-top also.

"Why are so many travelling today?" asked Professor Sreekantan the Director of TIFR who was sitting across from me. There was a local passenger, who replied: "Sir, on the Republic Day, people here feel that it is their privilege to travel free on the trains. So you will find this phenomenon on all trains travelling this route." Now I realized the apprehensions of Ram Suchit and Chandrama Singh.

The stop-go continued and the train reached Janghai already three hours late. There was to be a stop here for shunting and change of crew. Even under normal circumstances, the train would have halted here for half an hour. Today, nobody seemed to know when it would move. We heard several stories including that the driver had not reported for work. Or, that he had come at the scheduled time but went home as the train was so late. That somebody had gone to his house to bring him. And so on and so forth. After a full two hours wait the train finally took off.

As we waited patiently in our compartment, one Japanese scientist who had travelled with us from TIFR politely asked if this was the norm for our express trains. Having travelled in the Japanese 'bullet trains' at more than 250 km per

hour, we were ashamed to tell him our norms. That the railway minister had announced in the parliament that trains that maintain an average speed of 60 km per hour would be called ‘super-fast’ and travel on them would attract a surcharge. That this train was not super-fast but nevertheless an express train and as such it should have an average speed of around 40 km per hour and not a quarter of it as this train was managing. I also noticed that Sreekantan was reading a novel by a Russian author about prisoners in Siberia who have to spend years in isolation. An ideal novel for this train, we all felt as we sat waiting for hours for things to happen!

The Janghai-Allahabad travel was no improvement and we had instances when the train was made to stop by chain pulling to get more people on board or to discharge some passengers who felt that they had enough of the free ride. On one occasion the train was made to halt near a sugarcane farm as the free-riders got down to help themselves to sugarcanes. After all one needs sustenance during train travel.

By the time we reached Allahabad the train had taken more than twelve hours to complete a journey that should have taken no more than three. As we waited around midnight for the train to start on its journey to Bombay, some of us had nightmares as to the delays it would accumulate on this much longer part of its route. However, surprise was in store for us. The train started without any undue delay and soon picked up speed. The route from Allahabad was under the Central Railway whereas that till Allahabad was under the jurisdiction of Northern Railway. There was apparently a cultural difference between these two sectors. The train picked up some of the lost time and arrived in Dadar only six hours late.

But this experience made me aware of the cultural gap that exists in our country. People from different regions have different perceptions of civic responsibility, about law and order, about punctuality and overall time management. One day education will help bridge the gap: but this will require patience.

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Fred Hoyle had visited India for the first time in 1969 (*see Chapter 23*), when he came to receive the Kalinga Award. In 1973 he paid another visit on the way from Australia to the UK. However, it was his visit, in 1987 that I recall with special pleasure.

I had been pressing Fred to visit India, not only to have his lectures and

research collaboration for myself, but also because several of my colleagues were keen to have his visit. For his was a scintillating personality, always full of provocative ideas. Even those who disagreed with him could not deny that his views could not be ignored.

However, now having crossed seven decades of his life, he needed special comforts for travel and I felt that he would be persuaded to come if an invitation could be sent from a high quarter. I decided to write to no less a person than the Prime Minister himself. I had developed a feeling of admiration for Rajiv Gandhi for his openness to new ideas and his sincere efforts to combat bureaucracy. It was through his intervention that I had been able to initiate a major TV series in astronomy, called *Brahmanda* (see Chapter 29). Again this had been possible because of the PM's desire to get science closer to the masses. He would no doubt welcome an opportunity to invite a distinguished scientist and science popularizer like Fred Hoyle.

And so he did. He issued a very warm invitation to both Sir Fred and Lady Barbara Hoyle, which they readily accepted. The Department of Science and Technology was instructed to make all arrangements for their visit, including first class travel and stay in five star hotels. Their itinerary was drawn in consultation with me. They visited Delhi, Mumbai and Bangalore. As expected, Fred's lectures were very well appreciated by large audiences. Apart from the official functions they had very cordial invitations from friends in these places.

Later in 1987, we had another occasion to welcome Fred and Barbara, when they paid another visit to India in connection with the Goa conference. They visited, apart from Goa, Hyderabad and Pune. I recall the Pune visit when I accompanied them on the Deccan Queen from Mumbai to Pune. Knowing his liking for fish, I suggested that Fred sample the fried fish provided by the dining car of the train. He did and was very impressed, not only by the quality of the dish but also by the efficient way that the waiter served him at his seat. "He is far superior to any waiter on the British Rail!" was his verdict.

By the end of 1987, the possibility of a national centre for astronomy coming up on the Poona University campus was very strong. Local enthusiast for this centre was Naresh Dadhich, a general relativist from the Department of Mathematics who had already started the tradition of visits by distinguished scientists to the department. In Pune therefore, after Fred's talk at the university, Naresh Dadhich and I took him for a walk round the north end of the campus, where the GMRT building (see Chapter 35) was to come up. I explained to him that we were hoping to have the buildings of our proposed centre next

door to the GMRT centre. Fred was very pleased and strongly advised us, not to destroy any of the fine Banyan trees that graced the land. When the centre did come up we followed his advice and transplanted those trees that were threatened by the building plans.

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Although I have been part of organizing various scientific conferences, none in my memory came close to the ICGC-87 held at Goa in its scientific component as well as the overall ambience. The International Conference in Gravitation and Cosmology held in 1987 at Goa was the first of a series of such meetings that brought a number of leading scientists to India.

The Goa meeting was organized by the Tata Institute of Fundamental Research, and I was the person in charge of a team of enthusiastic persons not only from TIFR, but also from other places. Parelkar, a senior officer in administration helped in arranging accommodation. The Hotel Mandavi in Panaji (Panjim) was chosen as the conference venue and we had a large number of participants staying there. We also had rooms in hotels nearby for the remaining delegates. But all lunches and dinners were held at Mandavi which lived up to its reputation for delicious Goan food and ambience of Goan culture. On the Mandavi managerial side, Mr Prabhu helped a lot to make everything go smoothly.

Smooth management of the meeting by us ‘outsiders’ would not have been possible without help from ‘insiders’. The Association of Friends of Astronomy in Goa, an organization of enthusiastic amateur astronomers provided us with volunteers, young men and women who helped receive the delegates, go shopping with some, convey messages, and so on. Their motivator, a young man in his late fifties, Mr Percival Noronha has been a great friend and I always look forward to meeting him whenever I visit Goa.

The participants came from all over the world and we had a very distinguished collection of scientists like Fred Hoyle, Geoffrey Burbidge, Ted Newman, Malcolm Longair, Gian-Carlos Setti, Roger Penrose, Jurgen Ehlers, etc. One of the highlights of the cultural events was a gentle float down the Mandavi river in a special boat-ride hosted by the Chief Minister of Goa, Pratapsingh Rane, who was himself known for being a catamaran sailor. On the boat he had arranged for Goan songs by a local troupe of artists. The boat took us to a quiet spot on the river bank where a feast had been laid out. It was indeed a very memorable occasion.

The ICGC-87 was also a special occasion for me personally, because my

father could be persuaded to attend the conference despite his frail health. The conference delegates accorded a special welcome to him as he was one of the pioneer relativists from India.

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My love affair with Goa had started more than a decade prior to the ICGC. In late 1974, I was invited to deliver the Bandodkar Memorial Lectures in Panaji. As mentioned earlier, (*see Chapter 20*) in 1965 when I was on a grand lecture tour of India, I had received the gift of a magnificent brass lamp with provision for thirty six wicks, from the then Chief Minister of Goa, Dayanand Bandodkar. Bandodkar had been keen that I should visit Goa on that occasion, but as my very tight schedule did not permit it, he had sent this gift to me on behalf of the new territory that had joined the Indian nation in 1961. Somewhat belatedly, I was fulfilling his desire nine years later through a lecture series created in his memory.

I decided to go with all my family including my parents who also were keen to visit Goa. Although the organizers would have gladly arranged accommodation for all of us, I took up the invitation from the Goan industrialist Mr Vishvasrao Chowghule to stay in his guest house in Vasco. We were sure of special care as Mangala's uncle was labour consultant to the Chowghule industries and took personal interest in all the arrangements. As it happened, Brigadier Bhayyasaheb Apte, a senior member of the industries who was in charge of all local hospitality in the guest house, was also related to Mangala. He took every care to look after us.

On the organization of the Bandodkar Lectures, we were having close interaction with the veteran journalist and Editor of Maharashtra Times, Mr D.B. Karnik, who advised us on various items of sightseeing and cultural interest. There were several representatives in senior positions in the Government of Goa and Government of India who made all arrangements for our visits. As we were in Vasco, and were often required to spend the day in Panaji (- my lectures were in the evening in Panaji), arrangements were made for us to rest in Hotel Mandovi, in the special suite reserved by the industrialist Mr Dempo.

We visited the famous landmarks in Goa, spent some time on its beautiful beaches, took car drives and ferry-trips through as yet unspoilt landscape; in short we really had an excellent holiday with absolutely no hassle. Amongst the local dignitaries we were invited to tea by the then Chief Minister Smt Shashikala Kakodkar, daughter of the late Bandodkar. We were impressed by

her simplicity, as we felt that we were visiting a typical middle class family when we were in her house.

My lectures were very well attended. I spoke in Marathi as I was told that the audience would largely be Marathi speaking. Even though the common man feels intimidated by a scientific topic, thinking that ‘it would go over his head’, I had ensured that there would be slides and anecdotes to illustrate what I wanted to say. That the lectures were popular with the audiences could be judged by the fact that the audience strength did not dwindle, rather it increased as the lecture series progressed.

A rather humorous incident took place towards the end of the series. As I wound up my talks I told an anecdote: A lecturer was giving a rather boring talk and the audience was anxious for it to get over soon. But it dragged on and on, until one member of the audience stood up and took out a revolver. Seeing this the speaker started shaking with fear. “Don’t be afraid” said the man with the revolver. “I do not wish to shoot you. I am looking for the person who invited you to give this talk”. After telling this anecdote I was thanking the audience for their patience and suggesting that if they were dissatisfied, to direct their wrath to the organizers, when the secretary of the organizing committee walked in! He had walked in to propose a vote of thanks, but his entry right when I was concluding my anecdote generated special laughter and applause from the audience.

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In 1987, the Government of India announced that February 28 would be celebrated each year as the National Science Day. This date was chosen because in 1928, on the same date C.V. Raman had announced his scientific discovery that came to be known as the Raman Effect, and for which he was later awarded the Nobel Prize in physics. The idea was to encourage awareness for science amongst the common man and in general bring the population away from age old superstitions into the new mindset of the soon-to-arrive twenty first century. Of course the initiative came from Prime Minister Rajiv Gandhi.

On the first such occasion, the Department of Science and Technology organized a public lecture by me. When I arrived for my talk, I noticed that there were no less than three ministers on the dais! They all made passionate speeches extolling science and the scientists. I remembered a particularly emotional speech by the Minister for Human Resources Development (HRD),

P.V. Narasimha Rao. Mr Rao asked why was it that many bright scientists were leaving the country to do their brilliant work abroad. Could we not create conditions in the country that would ease the pressures on them, make working more attractive and thus keep them at home, he asked. Certainly, on listening to him, one felt that with such awareness at high level, the lot of our scientists would improve.

I gave my talk as suitable for the occasion, recalling the popular lectures that Raman himself used to give. He had a knack of captivating his audiences and I recalled his talk on the subject: Why does the sky look blue? Later, the Department of Science and Technology published not only my talk but also the talk by Raman to which I had referred.

But a post-script needs to be written. A few days after returning from my lecture, I was approached by some of my TIFR colleagues to intercede with the local central school to facilitate admission of their children. I have already referred to the problem of school admissions (*see Chapter 28*), especially in relation to the local central school. The scientists at TIFR did not come high on priority for school admissions, which were mainly in favour of the naval staff. Still, I went to see the Principal, who explained that he could admit TIFR children if a definite quota were created for them.

Who would be able to create such quota, I asked. Not the Principal, nor could the Commissioner in charge of the central school system do so. The decision had to be taken at the highest level in the HRD Ministry. That was when I recalled the passionate speech made by the HRD Minister and the applause that had followed his offer to ease the working and living conditions for scientists. Surely, I felt, that with his help with the problem of school admissions solved, the scientists could breathe a lot easier. So I wrote a letter to Mr Narasimha Rao requesting him to authorize a small quota for school admissions. I also mentioned that I was making this request in the light of his very fine speech on the National Science Day.

There was no reply, not even an acknowledgement that my letter had been received. After waiting for some time I sent a reminder letter, attaching a copy of my earlier letter. Still no reply! As the school admissions date was approaching I sent a final disparate letter in which I threw modesty to the winds and said that it was clear that the Minister's speech on the National Science Day was meant for the Press gallery and did not carry any sincerity of purpose. I also commented, that if a senior scientist like me who was a member of the Science Advisory Council to the Prime Minister did not even receive acknowledgement of his letter, what hope did a common scientist have for any

improvement of his lot? Would he not think of emigrating under such circumstances, I asked.

When I sent off this angry letter, I felt that even a thick-skinned person would be moved to a response. And I did get a response: a letter from the assistant to the HRD Minister simply acknowledging my letter. There was, of course, no action taken by the honorable minister!

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Perhaps it is appropriate to end this chapter with an event that did *not* take place, but which I cannot forget!

In 1975 I received an invitation to a college day function from an undergraduate college in Marathwada. Invitations to be chief guest for college days, for inaugurations of various functions, for distributing prizes, to preside over valedictory ceremonies, etc., had been coming to me since I returned to India. I had been declining these invitations quoting a policy decision taken by me to avoid formal celebratory functions. I am far happier addressing audiences informally on scientific topics, whether at a technical level or at a popular one.

However, this invitation was somewhat differently worded and so it attracted my closer attention. The letter stated that the college committee appreciated the fact that being the start of cricket season, I would be busy and hence find it difficult to spare time for the function; nevertheless they would all be very happy if I said 'Yes'.

Why should I be busy because of cricket season? It was true that I liked to watch cricket matches on TV, but that was an occasional pursuit and that too if I happened to have spare time. Certainly, cricket was not my main occupation. So I examined the letter more closely, noticing first that it looked like a carbon copy. [This was long before word-processors came on the scene.] Then I saw that my name and address had been substituted on the paper over an address typed earlier.

The name and address of the earlier recipient of this letter was Ajit Wadekar, Captain of the Indian Cricket team. The original letter had presumably been sent to him and he had declined. I was second on the list and so had received the carbon copy. The senders had not bothered to reword an appropriate invitation to the second-choice but had simply over-written the first address and sent the copy! Needless to say, I not only declined the invitation but also sent back the letter I had received stating that it would come in useful to them, in case they wished to approach their third choice.

**SAC-PM**

THE feeling of euphoria that had greeted the onset of Rajiv Gandhi's Prime Ministership had generated Camelot-type expectations. With a PM keen on science and technology playing a key role in the country's development the scientists as a community were experiencing a sense of relevance. To underscore his enthusiasm for S & T, Rajiv Gandhi departed from the earlier practice of appointing a Science Advisory Committee to the Cabinet (SACC), which had been a large and diffuse body made up largely of scientists, science administrators and bureaucrats. Instead, in January 1986, he created a small and cohesive "Think Tank" made up of scientists and industrialists *but no bureaucrats*. Called the Science Advisory Council to the Prime Minister (briefly "SAC-PM") it was headed by Professor C.N.R. Rao (normally addressed by friends as CNR or Ram), a distinguished chemist then heading the Indian Institute of Science at Bangalore. The other scientist members included Madhav Gadgil (environmental scientist from the I.I.Sc.), Roddam Narasimha (aerodynamics expert from the National Aeronautical Labs in Bangalore), Prakash Tandon (neurosurgeon from the All India Institute of Medical Sciences). Ashok Ganguly (CEO of Hindustan Lever), Shekhar Raha (Head of ICI) and myself. Also, V. Sidharth, scientist from the Department of Defence was deputed to be the Non-Member Secretary of the Council.

I had been asked over the telephone by the Prime Minister's Office (PMO) whether I would accept membership of the Council if so nominated by the PM. I agreed and shortly thereafter I received the official notification. The

nature of work, frequency of meetings and other details were still to be sorted out. However, my various commitments at TIFR and elsewhere were not going to be affected and I could continue to remain in TIFR.

It was while I was lecturing in Pune one morning in early February 1996 that message was brought to me that there was a telephone call from the PMO. I interrupted the lecture and went to the office of the Head of the Department Professor Damle. Sidharth was speaking from the other end. He informed that the first meeting of SAC-PM with the PM was going to be held the following morning when the Prime Minister would brief the members on what he expected them to do. Could I please make it to Delhi right away?

Reluctant though I was to cancel the next morning's lecture, the occasion warranted it. But a practical difficulty intervened; how was I going to make it to Delhi that evening ? Under normal circumstances I would not be able to secure a seat on the overbooked Indian Airlines' Pune-Delhi flight that evening. But with instructions from the PMO this was no problem. Damle, resourceful as ever, arranged a ticket Pune-Delhi-Pune through his travel agent. Sidharth also sent message to my brother at NPL that I was coming that evening to stay with him. And when I landed in Delhi that evening a staff car from NPL was waiting for me. The long arm of PMO had not only located me away from my usual haunt in TIFR but had ensured that I would get to the first meeting without any hassle.

The next morning I woke up to find Delhi wrapped up in dense fog and I felt lucky that I had avoided it the previous night; for it was obvious that no plane would land or take off from Delhi for several hours. Sidharth had sent a staff car from the Defence Dept to bring me to the South Block. As it wound its way round the Rashtrapati Bhavan, the traffic sentry saluted smartly. While I returned the salute I realized that it was not meant for me: it was meant for the car which manifestly was a VIP car. This was Delhi of the officials not Pune of the academics !

The South Block was wrapped up in the ubiquitous fog as well as in a tight security blanket for the Punjab problem was at its peak. As I made my way to the reception I had to sign forms and be checked for clearance. But I was made to feel at home by the greetings of CNR with a warm hand-shake. Sidharth, whom I was meeting for the first time took care of the necessary formalities. Soon all of us members of the newly-constituted SAC-PM were seated in an upstairs waiting room waiting to be called to the PM's conference room.

The other members had had a preliminary meeting amongst themselves

in Delhi the previous day, which I had of course missed. CNR and Sidharth briefed me on what had been discussed. This was the first meeting of the Council with the PM and essentially we would know from him what were his expectations from the Council and how and what we were to deliberate. Also, what would be the follow up action on our recommendations?

At the appointed time we were called to the Conference Room, normally used for high level meetings. It had the number 153. (I recall it because it has a special arithmetical property: it is equal to the sum of the cubes of the digits it is made of !) It had a long table and we were asked to sit on the side facing the central chair to be occupied by the PM. There were a few officials on the “other side”, none of whom I knew. While we were being introduced, the door opened and Rajiv Gandhi walked in, followed by the Cabinet Secretary B.G. Deshmukh and a few other officials of the PMO.

I was meeting him for the third time—the first was when I was at the opening of the Nehru Planetarium in Delhi by his mother and the second when I received the Rathindra Award from his hands at the Visvabharati in Santiniketan. I have referred to this latter encounter elsewhere in this book. But on all occasions I was impressed by his informal and relaxed attitude so much in contrast to his exalted position and the stresses he had to bear. Perhaps “urbane” is the adjective that would best describe him. How different from the pompous but rather petty minded bureaucrats one encounters in a typical government office.

I shall not dwell on the discussion of that morning except to say that in the hour or so that we spent with him, Rajiv very clearly spelt out his expectations from us. We were basically to offer advise on and monitor the five missions he had announced, we should express our views on S & T matters referred to us by him, and offer any suggestions towards making the country and the government more literate in the role of science and technology towards the progress of the nation and its peoples. He was interested in bringing out a document spelling out a perspective plan for the twentyfirst century. We were not government servants and as such could be free in our discussions, advice and criticism. We were to meet him from time to time and he would try to translate our suggestions into action, provided, of course that we could convince him of their appropriateness. He would set up an Empowerd Group of secretaries of the relevent departments to take follow up action on such suggestions.

We left the meeting considerably enthused. Here at last was an opportunity to be creative and imaginative, knowing that the top man is backing us. From

blue sky research to technology missions, from use of S&T in planning to the planning of S&T, from the creation and motivation of manpower for S&T to the S&T projects that could benefit the society—there was so much to think about. We went to the Indian National Science Academy for a brief follow up meeting of our own.

CNR set the tone of our modus operandi for the future meetings. We would meet approximately once a month, not necessarily in Delhi. Rather, we should meet in a scientific institution so that we can be in touch with different cross sections of scientists all over the country. Our discussions would be structured with an agenda but would be informal.

As I made my way back to the airport, I was apprehensive as to my flight back to Pune. The fog had lifted a couple of hours back... but what about the backlog of flights to be cleared through? How long would I have to wait ? Would the Pune flight be cancelled altogether ? Fortunately this did not happen. We in fact left on time. A good beginning for the new SAC-PM, I thought.

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The agenda and scope for our meetings had been broadly defined by the PM and in our meetings during the following three and a half years or so, specific matters were discussed and recommendations were made. Our usual custom was to meet either in the premises of the Indian National Science Academy (INSA) or in the headquarters of the Department of Science and Technology (DST), whenever the meeting was in Delhi. But as CNR emphasized, the SAC-PM's presence need not be confined to Delhi. He was particular that the council should be seen to be in close contact with scientists all over the country. He was also particular that even though this was a high-powered committee, its members should avoid ostentation in their meets, such as staying in five star hotels or resorts. In short, we should be seen as a committee of scientists living as scientists and working with scientists.

Our initial meetings were mainly about the S&T missions that had been announced and set up by the PM. Each of these missions made presentations before us on their progress and difficulties. We found that although the PM wanted to introduce a non-bureaucratic and dynamic mind-set all round, the same had not percolated down to the typical section-head in a mission. We laid down certain objectives and modus operandi as our recommendations to follow. In one of our meeting with the PM, we stressed this aspect and he

decided to appoint Sam Pitroda as an overall In-Charge of all the missions. Sam had brought in precisely those attitudes to his baby the CDOT (Centre for Development of Telecommunications) which in a short time brought about a revolution in the archaic telephone system. The remarkable implication of this revolution was that one began to have STD/ISD/PCO booths even in villages. This did bring about an improvement in the picture: a revolution in communications.

After a few meetings, there was a change of Secretary to the SAC-PM, from V. Siddharth who came from the Defence Department, to Prabhakar Lavakare of the Department of Science and Technology. Since the DST was the service department for the SAC-PM, this change facilitated many practical issues. Lavakare very efficiently managed to keep the SAC-PM on rails progressing forward smoothly.

There were numerous aspects in which technological innovations were coming into our day-to-day existence. Some were futuristic. Could they be channelled with special efforts spent on them? If so how? The SAC-PM discussed such aspects and in some cases carried out special studies based on inputs by experts in the field. In such cases, a SAC-PM member (or a group of them) acted as convener of the study.

To give an example, I was the convener for the study on 'Photonics', the emerging technology in which a photon, that is, a particle of light is made to travel in curved cables, made to interact with matter and thereby convey or transmit information very fast. In short, what electronics did in the 1960s, photonics promised to do even faster and more efficiently twenty years later. I had organized a couple of meetings of experts in TIFR and IIT, Bombay in order to prepare a report on the development of photonics.

Studies like this covered a wide range of topics. Apart from photonics, some of them were robotics, minerals development, advanced materials, parallel computing, lasers, chemical industry, agriculture and fertilizers. The studies aimed at highlighting the importance of emerging areas in which national activities should be initiated. A two-volume perspective plan document (referred to as the 'red book') for the new millennium was also produced.

S&T can be very effective in aspects of energy, transport, communications, etc. Some studies by SAC-PM were devoted to this aspect. I recall making a representation that transport on waterways can serve as additional mode of traffic for passengers and goods in view of the overburdening of the road transport. The SAC-PM found the idea attractive and wished to pursue this idea. Thus I was asked to convene a study of water transport. I had meetings in

Cochin and Goa with experts since these regions do have some waterways. Several recommendations on what strategy to pursue, were made.

There were some side-effects too. While in Goa on a meeting of the SAC-PM at the Institute of Oceanography to review India's Antarctica Programme, I mentioned that astronomers should take advantage of continuous night (in winter) and day (in summer) for several months when living close to the South Pole. This sentence appeared in the recommendations of our meeting. Although nothing happened at the time, several months later when a new Department of Ocean Studies was formed by the Government of India and Geophysicist Vinod Gaur was made its Secretary, he noticed the recommendation and followed it up with me by convening a study group of astronomers and ocean scientists. One practical outcome was the establishment of a solar telescope on the Indian site *Maitri* at the Antarctica for continuous monitoring of the Sun. This experiment produced valuable data.

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How did the novel experiment of creating such a think tank for the Prime Minister work? Certainly as members we found the atmosphere of our discussions and brainstorming very invigorating. By limiting the council to pure and applied scientists, and excluding the bureaucrats, the PM had basically told us to think freely and not to hesitate to make sweeping recommendations if they were needed to improve some existing state of affairs. How did this notion translate into practice?

The SAC-PM was a body that made recommendations to the PM. Whether to act on them or how to act on them was entirely in the PM's domain. He appointed an Empowered Group (EG) of secretaries of a few departments to see to the execution of these recommendations. As Lavakare later summarized: "Unfortunately, within the government system and within its operational framework and limitations, coupled with multiplicity of departments even within the S&T sector, it has not always been possible for the Empowered Group to arrive at quick decisions on the various recommendations. The Council has recognised this as an inherent price one has to pay for a democratic decision-making process.... But one often notices a sense of disappointment in the members of the Council when they find that their recommendations are tossed around from one forum to another and the decisions delayed."

One example of this was the SAC-PM attempt to bring about greater

autonomy in the operation of scientific research institutions. The Council's recommendations were followed up only partially as the government bureaucrats invariably see such autonomy as an erosion of their own sphere of authority. Sometimes there were political implications too. The SAC-PM had noted that owing to a judgement given by Justice Krishna Iyer, all educational and scientific institutions were treated as 'factories' for the application of labour laws and this brought unnecessary unionization into the academia. Apparently corrective measure excluding these institutions from the act had been passed by the Parliament and was awaiting Presidential Notification in the Gazette. But that had not happened because of pressures from unions. The PM saw the merit of the parliamentary decision and on more than one occasion promised to bring about its official notification. That this did not happen presumably indicates that the political pressures on the PM were strong and could not be resisted.

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Whatever the measure of success or otherwise of this exercise, I personally enjoyed my membership and would like to give credit to the stewardship of its chairman, CNR. I also found that my stock of jokes went up considerably, thanks to the many exchanged in our informal (unminuted) discussions. The PM met us, perhaps less frequently as a committee, than we would have liked; but we knew that he was fully in touch with our deliberations. The SAC-PM had been set up to last till 1990. However, a general election was declared in 1989 and with the resignation of the PM, the SAC-PM also stood dissolved. I had moved to Pune in June 1989 and recall having had one meeting there at the National Chemical Laboratory, by invitation of Ramesh Mashelkar who had joined SAC-PM in 1987. Because of airline delay, I missed the last meeting which was attended by the PM also in Delhi in October. But I carry happy memories of my experiences as a member of the council.

## TIFR : THE FINAL DAYS

By mid-eighties I was experiencing a feeling of boredom. My main research interest in the first half of 1980s had been on quantum cosmology. It sought to study the behavior of the classical big bang universe close to its origin when its overall size was supposedly small. In such circumstances the classical general theory of relativity proves to be unreliable in giving adequate and credible description of the behavior of the force of gravity. So a new theory is required and most scientists agree with this diagnosis, calling the theory *theory of quantum gravity*. However, just as medical experts agree on the diagnosis of a terrible disease but differ on its treatment, in the case of quantum gravity there is no unanimity amongst the workers in the field as to what is the correct theory of quantum gravity. Rather than get bogged down in technicalities, I will simply add that my own approach of *conformal fluctuations* looked at the behavior of volume of the universe close to the stage when it was very small, while assuming that the details of shape of the universe remained unchanged. (The adjective ‘conformal’ indicates that.) Such models of the universe form part of the subject usually referred to as *quantum cosmology*. As mentioned above there is no unanimity amongst the experts as to how this subject should proceed.

The work on quantum cosmology, to the extent that I felt it could be completed, I had done. The paper in collaboration with Pankaj Joshi dealt with the most general situations that could arise within the framework of conformal fluctuations and I firmly believed that going beyond the conformal case was going to be extremely difficult. So far as observational interpretation

of cosmology, my other abiding interest, nothing new and significant had turned up, what with the delays in the launching of the Hubble space telescope and the new technology telescopes still on the anvil. My scepticism of the relevance of the highly speculative work on the particle physics-cosmology frontier prevented me from getting into it in any big way. Thus researchwise I was at crossroads looking for an interesting but realistic enough problem to turn up.

In 1985-86, TIFR started a new and in my opinion, a very worthwhile experiment of collaborating with the University of Poona in a teaching programme for the M.Sc. courses in physics. That a vast brainpower lies untapped in research institutes, untapped that is for the purpose of teaching university students, is one of the tragedies of Indian higher education. One of the aims of Homi Bhabha in setting up TIFR had indeed been to create a source of trained scientific brainpower for the universities. But this did not happen in any significant way. The TIFR trained scientists either preferred to continue working at TIFR, or go abroad, or join organizations outside the university sector. Even the contacts between the TIFR School of Physics and Bombay University were very marginal. The School of Mathematics had a better track record in this respect, but even here those who actively participated in the programme were treated with some condescension as second class citizens. In short teaching was relegated to a lower position in comparison with research.

This aspect was, however, not specific to TIFR but could be seen as a general consequence of a short-sighted policy on science and technology pursued with zest after independence. This policy was based on correct premises but wrong perceptions. That S & T hold the key to the country's rapid progress was beyond argument and one must be grateful to Pandit Nehru for pressing this premise forward right from Day 1 of independent India. To implement a culture for S & T in the country, several scientific and technological research institutes were opened and well funded. The TIFR, with its origin in pre-independence India and having the leadership of Homi Bhabha was a pathbreaker in this campaign, followed by the CSIR laboratories created through the vision of Shanti Swarup Bhatnagar. Today we have several networks of research labs run by science departments like DAE, DSIR, DST, DBT, DOS, DOE etc.

While this was a good step with good intentions, because it was not accompanied in 1947 by another equally important and bold step, its effects turned out to be disastrous. The key to the second step lies in a statement of Pandit Nehru that is proudly displayed in the main conference chamber of the University Grants Commission:

*“...A university stands for humanism, for tolerance, for reason, for the adventure of ideas and for the search for truth. It stands for the onward march of the human race for still higher objectives. If the universities discharge their duties adequately, then it is well with the Nation and the People....”*

The statement is very true, and one of the many reasons why all is not well with the nation today is precisely that the universities have been steadily allowed to go under in academic quality.

So the second step which Pandit Nehru could very well have dictated but did not choose to do so, was a renaissance of the university system wherein growth was permitted under strict criteria of quality control. This did not happen and while the number of universities grew rapidly in post-independence India their quality went down. More importantly, the gap between the national research labs and the university departments widened on all counts. Working conditions, facilities and opportunities for career advancement, in all these respects it became more and more attractive for a young scientist to move from the university sector to the national laboratories like the TIFR. Not only that, senior scientists with good research productivity in the universities were attracted to join the national labs, creating quite the reverse of the flow envisaged by Bhabha.

However, within three to four decades, the national labs also began to suffer from this widening gap in an altogether different way: their contact with that vast storehouse of fresh talent, viz., the undergraduates, became more and more tenuous. On the one hand the students on the university campuses did not know what exciting research opportunities lay in S & T, and on the other, the national labs could not attract adequate young manpower for many of their growing programmes.

During my tenure in TIFR, I was becoming increasingly aware of this problem : it was becoming harder and harder to find bright research scholars interested in doing doctorate in basic physics or mathematics. The able and the motivated would largely be filtered out at the higher secondary school level with a majority opting for professional courses like engineering, medicine or accountancy, a select few going to the IITs and thence to the land of greenbacks or to careers in management. Those who remained in the science stream and opted for pure sciences or mathematics very rarely did so through a strong motivation. How rarest of rare the high quality has become is shown by the fact that of the students applying for a research scholar's position barely two to three percent would make it to the final shortlist.

Even those who were selected had generally been badly taught at the

M.Sc. level. Very few of them were exposed to real excitement in science on their university campuses. That they made it through the stringent selection procedure at TIFR was in spite of, rather than because of, their training. They made it through their innate ability and motivation. Such a situation would not have arisen if the universities were exciting places for research, with teaching being imparted by scientists engaged in good quality research. Because of research receiving low priority in the overall evaluation process of a university teacher, there are, today, very few cases of exciting scientific research coming out of university campuses... and those exceptional cases deserve all the more credit for flowering in a hostile climate.

It was against this background that the TIFR Physics Faculty had discussions with the Physics Department of Poona University so as to initiate a teaching programme in M.Sc. physics.

The TIFR-Poona University joint programme that emerged from these discussions, was an experiment to involve the TIFR faculty in teaching students of M.Sc. physics at Poona University. Unlike the University of Bombay which should have logically participated in such a joint exercise it was Poona University that came forward. The Physics Department at Poona University had, over the years, developed a healthy tradition for research and using the departmental autonomy it was in a position to restructure the courses and introduce novel teaching methods.

It was Bhalachandra Udgaonkar, a senior professor of physics and one time member of the University Grants Commission who took the initiative in this programme and was responsible for getting it off the drawing board. However, not all TIFR physics faculty members were enthusiastic. There were those who had never taught a course even at TIFR, and one did not expect them to commute to Pune to teach there. Then there were those who had taught in the TIFR graduate school but considered M.Sc. teaching either a fruitless exercise or below their dignity. But there were still a sufficient number enthusiastic enough to guarantee success of the programme.

Of course, there were hiccoughs and misunderstandings to occasionally mar an otherwise cordial relationship between the two organizations. The Physics Department agreed to take ten students through a national selection with scholarships from the UGC. The University made a flat on the campus available for the visiting faculty from TIFR. As a teacher during the 1985-86 session I enjoyed those visits and the experience of teaching an M.Sc. class in electrodynamics. I wish the programme had continued longer than it did.

I do not know what exactly came in the way of the programme; but

gradually the gap in the two parties' perceptions of the programme grew. Those at TIFR began complaining about the bureaucratic rules of Poona University while the Poona University physics faculty began to sense a superiority complex on part of their TIFR counterparts. There were fewer TIFR faculty members willing to teach, with the result that the sharing of the burden became uneven. I personally feel that it was this last reason that finally forced the programme to grind to a halt after three years.

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By 1987, I began to feel increasingly that I myself needed a change in my existing work pattern. The urge to take on something new and more challenging than my existing work began to grow. Apart from my membership of SAC-PM, I was also appointed a non-official member of the Indo -US Sub-Commission on Education and Culture. These interactions provided some outlets for my urge, but they could not be expected to occupy more than ten percent of my time. Perhaps this kind of feeling comes to many scientists at some stage in later life. Some find a greater satisfaction in becoming science administrators or just plane administrators. A few make it to Delhi as science advisors to ministries or as secretaries to some of the science departments.

For me Delhi held no attraction. In my many visits to the nation's capital I had found it to be a city with hierarchies, with each one conscious of exactly where he or she stands. To transgress the narrow limits this hierarchy imposes, even inadvertently is frowned upon; to do so deliberately opens one to the accusation of plotting and scheming. While this may well be quite natural in an administrative or a diplomatic environment, it is unfortunately quite common in academic and scientific institutions of the capital city. Informal chats with senior scientists, canteen table conversations etc., always bring the awareness of being near the corridors of power.

The second aspect that hits you whenever you visit a government office in Delhi is the absence of work culture. To get anything done, howsoever routine, you need to have money or influence. Letters sent by you can become "untraceable", even if they are traced, or if you send duplicates, you need to follow up with phone calls or personal visits, and of course your enquiries about the relevant official often end in the information "Wo kursi par nahin hain" (He is not to be found in his chair). And if officers act this way what can we expect from Class III and IV employees? And, the same culture has now spread to academic and scientific institutions in the city.

There are those from provincial cities who thrive in this environment and long to make a transition to Delhi. Others go to Delhi reluctantly at first, but gradually learn to adjust to the mode of work and eventually relish the exercise of what little power their position brings. Not belonging to these categories Delhi held no attraction for me. A new possibility, however, opened out in 1987 in Bombay, right in TIFR.

B.V. Sreekantan, the Director of TIFR was going to turn 62 in June that year. Being past sixty, he was already on extension as Director and it was known that he would retire at the end of June. Who would be his successor? As the opening months of 1987 began to pass by this question gained increasing currency.

As I recalled earlier, thirteen years ago when Gokul Menon announced his intention to leave for Delhi the question of his successor had to be faced. At that time I had been in TIFR for barely two years and a research career held primary attraction for me. So, even though there were soundings from some quarters as to whether I was interested in offering myself as a candidate, I had declined to be so considered. I had also felt that I was not familiar enough with the Indian, especially TIFR conditions well enough to be able to take on the directorship.

In 1987 the situation was different. After nearly fifteen years at TIFR I had acquired considerable familiarity with the institute and its problems and personalities. I had also witnessed the steady growth in its infrastructure and academic activities and also the steady decline in its standards.

To the outside visitor from any part of India, or even to a visitor from abroad who had been to other institutions or universities in India, the TIFR in 1987 still looked impressive. Although the maintenance of its buildings and the surroundings had deteriorated compared to the sixties, it was still far better than in any other comparable institution I had seen. Its faculty were seen to be active researchwise with many of them internationally recognized, its scientists played a leading role in the workings of science academies and other national committees dealing with S & T and its graduate school still attracted the best amongst the available pool of students. Thus, to a large body of outside academics things seemed to be going on well with what was seen as the premier scientific institution in the country.

The insiders' perception was different. There were several causes for grave anxiety. First, since the departure of Homi Bhabha the autonomy of TIFR was being slowly but steadily eroded. A strong director could have taken a stand and pressed for Bhabha's standards of autonomy. Menon had too many things

on his plate to be able to do anything, even if he worried about this issue (which I think he did not). Sreekantan was too mild mannered to go in for any confrontation with the DAE. Thus many of the missives received from the Department were meekly accepted and acted upon. A ridiculous instance of this was when President Fakruddin Ali Ahmed died in office. Clearly there was a case for keeping the Institute closed on the following day. However, since the clearance from the DAE had not come till lunchtime the next day closure for the rest of the day was not announced till then.

The growing influence of the DAE bureaucrats can also be seen in the declining standards of the buildings built by the Institute from 1976 onwards. Anyone who compares the original office block ( A-Block ) of TIFR built during Bhabha's days or even the Bhaskara Block built soon after his death with Panini, Parashara, Raman, Ramanujan and Meghnad will come to this conclusion. A ludicrous example of the cost-cutting exercise is seen in the partial stone cladding (to match that of the main office building) of the D-Block constructed in the mid-eighties. Poor specifications were accepted because the bureaucrats said that those were the government norms. If government norms were paramount then one has to ask how TIFR managed to construct the original A-Block?

But worse still was the deterioration in academic environment itself. When an institute grows forty years old it has to conduct a critical self-examination as to whether its research portfolio is relevant. In a rapidly changing S & T scene, some research areas become obsolete while new ones have to be introduced. TIFR did conduct such periodic exercises but they were half-hearted in the sense that although everyone was aware what areas were obsolete or not able to function properly, there was no weeding exercise. By and large this criticism can be levelled at Indian science in general with all top scientists following an "I scratch your back, you scratch mine" policy and no unproductive area being terminated. But as a premier institute in the country TIFR should have shown the right way.

Finally there was staff dissatisfaction at all levels not only amongst the non-academic staff but also amongst the academic ones. The reasons for the two categories were of course different. The middle level (fellows and readers) amongst the latter were justifiably angry at the somewhat arbitrary way that the promotion cases were handled. Besides, while the seniors took all the important policy decisions there was hardly any consultation at the young or middle level of scientists. Amongst the non-academic staff unionisation was increasing, there were accusations of corruption at higher levels, dissatisfaction

in allotment of staff quarters which was claimed to be done arbitrarily, and so on.

In short, to the insider, TIFR in 1987 was not a happy place. There was a general sense of drifting with no strong guiding policy nor a driving force towards new objectives. There was one hope that with a new director the Institute may once again acquire a purpose for existence.

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The greatest danger to any organization whether it is the Roman Empire or a small voluntary organization, has come not from outside but from within, from complacency in the governing body that takes important decisions. TIFR was no exception. The dissatisfaction at lower levels I have referred to was either not appreciated at the top or dismissed as an issue of no great consequence. By "top" I mean the apex body of the Institute, the Council of Management. It was, however, this body that was now called upon to take the all important step of appointing the new director.

The Council includes three nominees of the Government of India, two of the House of Tatas and one of the Government of Maharashtra the three organizations who were party to the historic MOU that brought the Institute into existence. The Chairman of the Council was the redoubtable J.R.D. Tata who had chaired the Council right from its beginning. The other Tata nominee was the Founder's brother Jamshed Bhabha. The Education Secretary represented the Government of Maharashtra. The GOI nominees were Srinivasan, the Chairman of the Department of Atomic Energy, the main funding agency for TIFR , the Director of Bhabha Atomic Research Centre, P.K. Iyengar and the Finance Secretary of the GOI as Member Finance. In addition the Council had a member under the category of "a scientist who has the interests of the Institute at heart". This position was graced by a scientist whom I shall refer to here as X. The Director, TIFR is the Member Secretary of the Council.

On paper it looked an excellent team, like an all time cricket world eleven that might include Bradman, Sobers, Lindwall, Hall, Kapil Deo and Gavaskar. Unfortunately, a world eleven consisting of stars drawn from all cricketing countries may not perform well against a national side, for it lacks purpose and cohesion. The TIFR Council suffered from a similar handicap. JRD, who had set such high standards in management in the Tata empire or in bodies under him like Air India had all along refrained from getting too involved with TIFR,

preferring to leave the management of a scientific institution to the scientists. This had been TIFR's great misfortune, for the issues facing it in the seventies and the eighties were largely of management nature. Jamshed Bhabha with his enormous experience in the world of the arts, was conscious of the gap between two cultures and likewise kept away from influencing decisions made by the scientists.

The representative of the Government of Maharashtra was a lightweight member since the involvement of the GOM with the affairs of TIFR was very marginal. The Member Finance offered his views only to the extent of financial issues. Thus the real decision makers in the Council were the four scientists, two from DAE and two from TIFR, if one identified X with TIFR. These held the key to the choice of the next director. It was not surprising therefore that the Council constituted an informal Search Committee consisting of Srinivasan and X to come up with a shortlist of names for the Council's consideration.

As its name implies, the Search Committee is expected to "search" for a suitable panel of names. The search procedure is of course not formally defined. Thus it could include soliciting views from informed sources, informally talking to prospective candidates, probing their past records and achievements, and also gauging the sentiment of the members of the Institute at different levels. The last is not the least since the director has to deal with members at all levels and their perceptions and expectations were certainly relevant to the issue especially in view of the prevailing situation that I have just outlined.

If I were to start the search procedure, I would have begun with two senior and distinguished scientists at TIFR, Obaid Siddiqi, the molecular biologist and Govind Swarup, the radio astronomer. Both commanded international repute and were aware of the existing problems at TIFR. Were they themselves interested in taking on the job? If not, did they have other names to offer for consideration?

I do not know what exercise the Search Committee carried out. I do know that Srinivasan had two long chats with me and Virendra Singh, of course separately, in his chambers at the DAE Headquarters in the premises of the Old Yatch Club. We two were generally identified as front-runners for the job. VS was a particle physicist also interested in the history and philosophy of science. I was personally satisfied with the chat I had in which Srinivasan asked the right kind of questions. Many persons had suggested my name for the position : was I interested in being considered ? Who others from TIFR in my opinion should be considered? Should candidates from outside be also considered ? Who in the institute should be consulted for suggesting possible

names ? What, did I feel about the requirements of a new director ? What were the priority areas for action? And so on...

I answered these questions frankly. Yes I was willing to be considered for the position, although I felt the Council may first talk to Obaid Siddiqi who would be my choice. I could not think of any other obvious name either from inside or from outside, although to the latter alternative I had not given any specific thought. Members at all levels in TIFR should be consulted since there were outstanding issues concerning all of them and there should be a general confidence of all employees in the new person to be selected as director. I briefly outlined my thoughts on the need to revitalize the institute. Srinivasan also asked me if I had any specific views on Virendra Singh whose name was also under consideration. To this probe I replied that our careers had broadly run parallel and though I would have no problem with his choice as director I would not like to make a comparison with myself as it would not be objective.

On the way back from the OYC, I did attempt to think of an objective set of criteria for comparison between the two of us. An objective criterion I felt was the annual report of the Institute. How was each one of us contributing to the various activities of the organization as reported therein ? An academic member's contributions include research, teaching in the graduate school, guiding students for Ph.D., delivering seminars and colloquia, etc. Then there were ways of judging international standing, like invitations to international meetings as plenary speaker, work as a referee for professional international journals, citation, etc. Then there was the distinction enjoyed by the person in public. No less important issue was how was the member respected by the staff of his institute. These were the gradescales on which I felt an objective comparison could be made. When I attempted to apply these to the two of us, my admittedly biased conclusion was that I came out better.

This, however, appeared to be the general impression at all levels in the Institute and it would not be unfair to say that in racing jargon I was the "favourite". Another aspect which did not feature in my objective criteria above was the fact that I was a Maharashtrian and thus could chat with the administrative and support staff, who were largely Marathi speaking in their mother tongue. I should stress, however, that in a national institute of science this aspect is unimportant: but in running an institution the local environment does assume a non-trivial role.

Amidst all these speculations which surrounded the search procedure, there was one apparently strange aspect to which a colleague, Sudhanshu Jha drew my attention. X, the other member of the Search Committee had not

come down to assess the local opinion. Why did he stay away from the search procedure ? This manifest lack of action, like the dog that did not bark in the Sherlock Holmes story, was a significant event as I was to realize later.

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Finally, through whatever means, the Search Committee made a shortlist of two, and Virendra Singh and I were invited to meet the Council on May 29. Earlier the Council used to meet at TIFR itself but on this occasion, for whatever reasons, it decided to meet in the OYC. So both of us went there at 2.30 p.m. and were asked to await our call in a waiting room.

Sankaranarayanan, the Registrar, and a couple of other senior members of TIFR administration were around to bring any messages and documents to and from the Council. VS was called first and must have been away for about three quarters of an hour after which he left. Then I was called.

I recall it as a very sultry afternoon, and it was a relief to be inside an airconditioned room. JRD was in the Chair, looking visibly tired and jaded, quite unlike the image of him that I had in my mind. Age, indifferent health and weather may have been the contributory factors. J.J. Bhabha, P.K. Iyengar, X, the Member Finance, B.V. Sreekantan and the representative of the Govt of Maharashtra were present. There were nods and smiles of recognition from members and I was invited by the Chairman to take a seat. "Let us get on with it..." he muttered and then asked me to say what I felt were the tasks ahead of the new director to be.

Here I wish to record my appreciation of the British system in which the existing incumbant does not sit on the selection committee of his successor. The reasons were brought home to me that afternoon. Here I was being asked to give my frank opinion of the rather run-down state of the Institute, for which the existing director was formally, if not directly, responsible; and then to say how I could improve on his performance. I had to be honest but also tactful which is not often easy. Nevertheless I did my best, emphasizing the need for bold new initiatives on the research front, with areas like high temperature superconductivity, photonics, molecular biology and astronomy as ones to highlight or to take up anew. This would also mean terminating some of the outdated and unfruitful areas currently being pursued.

When I had finished I expected a lively discussion with some quizzing on the part of the Council members as to what specific areas should be sacrificed so as to divert the funds to new areas. I also expected that there might be some

questions on how the Institute should be directed and run. But nothing of the kind took place. There were a few cursory questions and polite remarks of no great consequence. Indeed, I had a feeling of anti-climax when the Chairman thanked me for being present and that was it. I was ushered out.

Virendra Singh had already left when I reached the waiting room. A car was available to drop me back to TIFR. As I rode back I was trying to figure out what it all meant. The way the interview (if it can be so called) was conducted, the Council did not appear to attach much importance to it. Probably its mind was made up and the interview was just a farce. But then whom had they selected?

That evening when I rang up Mangala, who was in Pune, she asked how did the interview go. I recall making a non-committal reply, stating that so far as my part in it was concerned it went off OK. The question was: how soon would the result be announced in public?

Of course, one has to allow for minutes of the meeting to be written and approved and then approval to be obtained from the Prime Minister who was the Cabinet Minister in charge of the Department of Atomic Energy. The fact that this last approval was needed indicates that the autonomy of the institution is limited: otherwise why should the apex body, the Council of Management, need refer its decision to the Government of India for approval ?

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May passed and the month of June also drew steadily to a close and as it was known that Sreekantan's term as Director was due to expire at the end of June, everyone expected the result to be declared before that date. Rightly or wrongly, almost everyone at TIFR expected that I would get the job.

This was becoming increasingly embarrassing to me as I had not any clue as to what had been decided by the Council, although the decision must have been taken that afternoon in May. I believe, Virendra Singh also was in a similar situation, although, in betting terms I was the "favourite" and he the "underdog".

By mid-June, however, I got distinct signals that the Council had decided contrary to the general expectation. Two of them were indirect but the third and the last one was clearcut.

As a member of the Prime Minister's Science Advisory Council, I had been trying hard to get the Government of India to pass a law that removed scientific and educational institutions from the list of organizations declared

as "factories". Ridiculous though this may appear, thanks to the judgement given by a learned judge, labour laws were being applied to such institutions treated as factories, perhaps on the grounds that they manufactured degree holders. When I briefed our Director on the progress of this effort he complimented me and said that he hoped that I would keep briefing his successor likewise.

The second hint also came from Sreekantan. I had been invited to a prestigious visiting professorship at the College de France, in Paris in the spring of 1988, and I needed leave of absence. I applied in June, 1987 and he approved it right away. Now, if I were to be his successor, he could not have done so!

However, the direct information came from another quarter. When I was attending the SAC-PM meeting in Delhi in June, C.N.R. Rao told me that the TIFR Council had taken the decision of appointing Virendra Singh as the next Director, a decision that he personally regretted greatly as he saw it as the continuation of downward slide of TIFR under the euphemism of maintaining the status-quo. He told me bluntly the reason " You as a Director would not have remained under X's thumb as the next Director will be."

Although the earlier indications were mere surmises and could still have been wrong, there was no reason to doubt this last source of information. CNR had access to a number of academic grapevines. But, he was also a member of the Atomic Energy Commission which no doubt would have been informed of the important appointment at TIFR since it came under the administrative control of the DAE. But his reason caused me considerable anguish, largely because till then I had regarded X as a friend and well-wisher.

But now everything began to fall in the right place. Why had X not come to TIFR as a member of the Search Committee to gauge the local opinion? Because he had made up his mind on what type of person was good for TIFR as its Director. With his belief that he knew TIFR inside out and therefore could make up his mind this way, it may never have occurred to him to go and talk to staff members, as Srinivasan had done. This is the same traditional syndrome that made parents fix the marriages of their offspring without consulting them in the honest belief that they knew what was good for their wards.

Clear also was the Council's rather superficial interview that day, for the decision had already been made. And here I can very well believe X's sophisticated and perusive way of reasoning that would sound completely reasonable unless you probed it deep enough to discover the motive underneath. Thus he would have made a case for a person who "knew" the institute long

enough (-I had been at TIFR for a mere fifteen years and had joined it from abroad whereas Virendra Singh had been there right from his student days and for double the length of time.) I believe the “status quo” card may also have been played smartly, which said that the Institute cannot afford to take on new venture areas of research as I was advocating, but should consolidate on what it had so far achieved.

Finally, another argument that may have carried with the DAE bosses was the independence that I as a Director would have displayed with the Department of Atomic Energy, reversing the trend making TIFR more and more subservient to the DAE.

Although in a committee meeting there are a number of members present at a time, it is not uncommon for a more persuasive talker to influence the decision, especially if he creates the impression of insecurity amongst some members should his recommended decision is not taken. So I felt (and this impression was subsequently borne out by chats with some Council members) that it was the advocacy of X that influenced the Council’s decision.

So I had reconciled myself to the fact that I was not going to get the Directorship of TIFR. But others around me who were not privy to this information continued to expect that announcement of my name was imminent. And the announcement itself got more and more delayed, causing further speculation.

Finally, the Council’s decision was announced in the morning of July 1, and the manner in which the announcement was made caused me greater anguish that its contents. I learnt of it when a colleague came telling me that it was on the general notice board.

I felt deeply hurt by this. Considering that Sreekantan, as a member of the Council was in residence, it would have been quite easy and in a better taste for him to have called me to tell the decision before making it public. But by 1987, TIFR had become much closer in its working to the way a government department operates. Bureaucratic correctness and impersonal approach had begun to be preferred to matters of taste, tact and personal touch.

Nevertheless, I should restate this. My unhappiness was not at the decision itself (which I had come to accept) but at the way it was communicated to me. In a few days, both Sreekantan and Srinivasan came to know of my unhappiness and, to be fair to them, they called me for a long chat. Although they were careful to maintain the confidentiality of the Council’s deliberations, I was still able to confirm my suspicions as to the main motivating force for its decision.

I may also mention that a few days later I had to go and see X himself to

discuss unrelated issues. He never mentioned the TIFR episode, nor did I raise it myself. But a few months later, my friend Vittorio Canuto from the City College of New York related an amusing episode, which throws light on how misinformation can be subtly disseminated by an adroit politician.

Vittorio, who knows X very well, saw him in Delhi during his trip to India. As no contemporary Indian scientist could be, he was blunt with X and asked him why my name was passed over for the Directorship of TIFR. X replied that because at that time I was expected to take over as Director of IUCAA. X certainly must be clairvoyant for, in May 1987, IUCAA was not even a concept, let alone having a prospective Director! Canuto pointed this out to X, for once reducing him to silence!

The decision of passing me over nevertheless caused considerable anguish amongst the TIFR staff at all levels as I came to know directly, or through indirect channels. For, in 1987 TIFR was passing through a crisis stage when staff members, whether academics or in the scientific cadre, or in the administrative or support category, were questioning the basic ethos of the institute then entering its fifth decade. Far from a status quo, they aspired for a new sense of purpose, and were clearly disappointed in the Council's choice. Why was my name passed over? This was the question many of them asked and the answer given was that I myself was not interested! Thus the misinformation was very cleverly distilled to prevent any adverse reactions.

It is problematical, of course, as to how I would have performed had I been given the chance. It is a matter of history that in the decade that followed the TIFR steadily declined not only in its external reputation but also became internally an unhappy place. This happened largely because its top authorities and policy-makers from the Council downward failed to recognize the symptoms back in 1987. Whether being in the Director's seat I could have reversed the trend towards its golden days of the early 1960s is doubtful. It would certainly have been very difficult, time consuming and nerve-racking for a Director making the attempt...but I at least was willing to give it a try.

If one may jump ahead by a decade or so, my reservations about leadership at TIFR turned out to be justified. Things went from bad to worse, and in the end the TIFR Council had to appoint a review committee of distinguished scientists to examine the working and achievements of the institution. For an organization that did not believe in external evaluation of itself this was a great turnaround of policy. The review committee made some scathing comments and amongst its recommendations stated that the director's term should not be renewed. Thus it was that in July, 1997 Sudhanshu Jha took over as director.

In the end, for me this unhappy episode turned out to be a blessing in disguise. For in a few months I was given the opportunity that was far more exciting and intellectually satisfying than what I had been denied.



POONA



IUCAA Foundation Ceremony.



## THE BIRTH OF IUCAA

IT was in August 1987, when I was still smarting under the decision of the TIFR Council that Naresh Dadhich from the Department of Mathematics, University of Poona approached me with an idea. The idea, originating with Yash Pal, the then Chairman of the University Grants Commission, involved the setting up of a national centre for astrophysics in the University. The genesis of the idea had a further history which first needs recounting.

In 1986 when the TIFR-Poona University joint teaching programme was going on, Govind Swarup, the star radio astronomer from TIFR received the green signal to his ambitious project called the Giant Metrewave Radio Telescope (GMRT, in brief). Govind was one of the trio of radioastronomers who had returned to India after careers in the USA in the mid-sixties to early seventies in response to Bhabha's invitation. All three had joined TIFR but two, Mukul Kundu and Kochu Menon went back to North America a few years later. Govind had continued his career in TIFR and by the late seventies had become a senior professor.

Govind had master-minded the Ooty Radio Telescope, and after it had been operational in the seventies, he had begun to think of a bigger and more sensitive version. First he had tried to simply enlarge upon the idea of having a cylindrical system with axis parallel to the Earth's spin. Such an arrangement enables a source to be tracked as the Earth spins about its axis. This idea for a very large system would require its positioning on or near the equator, for then the axis of the telescope would be near horizontal and it would save on the enormous engineering problems of creating the exact slope as had been done

for the smaller version at Ooty. Govind called this proposed model the Giant Equatorial Radio Telescope (GERT).

Govind had canvassed for his telescope with a few countries where it could be possibly built. The requirements were: (a) the country should be rich enough to advance sufficient capital for the project, (b) it should have at least some reasonable S&T infrastructure to nurture the project, (c) it should have a stable enough government to ensure the continuity of support over several years, and of course, (d) the equator should pass through the landmass of the country. The UNESCO supported the initial search and brainstorming for the GERT. But in the end it became clear that there was no country meeting the requirements (a)-(d), although Kenya came near.

In 1984, in a joint meeting of leading astronomers and astrophysicists from various institutions and universities drawn from all over India, a serious exercise was undertaken to discuss the country's next five year plan for astronomy and astrophysics. The meeting was convened by the Department of Science and Technology with the express interest of conveying to the Planning Commission the recommendations of the astronomical community. This was an opportunity to think big and propose some significant advances in the nation's observing facilities.

In those times the optical astronomy facilities were distributed as follows. The oldest facilities existed in Kodaikanal and later at Kavalur in Tamilnadu in the south. These were the solar radio telescope at Kodaikanal, a 2.3 metre telescope at Kavalur supported by smaller telescopes like the 1-metre and 70-centimetre telescopes at Kavalur. These facilities were controlled by the Indian Institute of Astrophysics set up by the late Vainu Bappu. The next important facility was at the Uttar Pradesh State Observatory at Naini Tal in the foothills of the Himalayas, with a 1-metre telescope together with a solar telescope and smaller instruments. In Hyderabad, the Osmania University was unique amongst universities in having under its control 1.2 metre telescope at Japal Rangapur. In Ahmadabad, the Physical Research Laboratory set up by the late Vikram Sarabhai was already planning a 1-metre infrared telescope at Gurushikhar on Mount Abu.

With this background, the optical astronomy community pressed for a 4-metre class telescope similar to those already in existence in several observatories round the world. However, their clout was not strong enough. The Member, Science of the Planning Commission was reported to have recommended instead that two 2-metre class telescopes be built since the expertise of building this type of instrument already existed. This ridiculous

recommendation ignored the scientific aspirations to go towards bigger and more advanced facilities to handle world class observing problems. This may be contrasted with the fate of a similar application by the Japanese astronomers for a 4-metre telescope: their funding agency recommended that as there were already many 4-metre telescopes around or in making, the astronomers should propose a bigger facility. In the end the Japanese got an 8-metre telescope.

At radio wavelengths, however, Govind did possess sufficient clout in the form of previous achievement (of building the Ooty Telescope), persuasive arguments and most importantly, contacts in the Planning Commission. So his proposal to build a Giant Metrewave Radio Telescope (GMRT) originally estimated at a cost of Rs 20 Crores was accepted. After carrying on site-surveys he finally homed on to a valley in the neighbourhood of Narayangaon, a small town on the highway connecting Nashik to Pune. Its distance being around 90 kilometres from Pune, Govind decided to look for an area of around 10-15 acres in Pune for housing his institute that would regulate the telescope. After several rounds of negotiations he got a piece of land in the northern part of the sprawling campus of Pune University. By late 1987, building work had started on the GMRT project, both in Pune and at the village of Khodad near Narayangaon.

These developments came at the time Naresh Dadhich approached Yash Pal as the Chairman of the University Grants Commission (UGC) for support in setting up a centre for astrophysics and relativity at Pune University. Both he and Yash Pal soon started mulling over the idea of a university-based development in astronomy and astrophysics at the University of Pune. The levels of perceptions of the two differed considerably, however. Naresh was already running a successful visitor programme in theoretical general relativity and it had attracted internationally famous scientists like Abhay Ashtekar and Jurgen Ehlers. He wanted to enlarge the concept so that a centre for theoretical astrophysics and relativity could be set up in Pune University. Yash Pal was thinking on a grander scale: with the GMRT coming near Pune, he felt that time was ripe for setting up a National Centre in astronomy next to the GMRT Centre on the university campus. At a meeting convened in his office, which was attended by Naresh and me as well as the UGC Vice-Chairman Rais Ahmed in September 1987, Yash outlined his vision for the centre. This centre would look after the needs of the academia of *all* the universities in India who had interest in teaching and research in astronomy and astrophysics (A & A). Fortunately, the concept of such a centre of excellence and statutory powers to

create one, existed already within the powers of the UGC. The concept was known as an *Inter-University Centre*.

One may define an inter-university centre as a national centre which serves as a nodal point for universities in a given field of study. In that field, the centre would develop and house advanced facilities that would normally cost a lot and thus would be beyond the budgetary limits of a single university. These facilities would be at the disposal of staff and students of universities, interested in developing the field. Funds would be made available for them to travel to the centre for using these facilities as well as for participating in any schools and workshops that the centre would organize from time to time in different aspects of its field of study. Clearly, this mode had the merit of economy of operations through sharing and also of greater utilization of its facilities through larger usership. Work on the first such inter-university centre, called the Nuclear Science Centre, (now renamed Inter-University Accelerator Centre) had been initiated by the UGC in 1984 and was based around the facility of the nuclear accelerator pelletron. Now Yash Pal proposed a centre for astronomy and astrophysics, to be called the Inter-University Centre for Astronomy and Astrophysics (IUCAA).

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The second part of 1987 saw vigorous brainstorming. Naresh realized soon enough that the concept of IUCAA presented far greater opportunities than his own more modest concept of a university-based centre. Both he and Yash Pal felt that my participation in the development of the concept of IUCAA would be very desirable. As I mentioned earlier, this development coincidentally happened at a time when I was getting disillusioned by the internal politics of the TIFR and was feeling the urge to get involved in some academic activity elsewhere. I had also been feeling that the widening gap between the facilities available to the university academics and their institutional counterparts, required some redressing. The setting up of IUCAA provided the right opportunity for such an effort. So I readily agreed to get involved in exploring how to set up such an institution.

The work was indeed cut out for me. The following problems needed to be solved before such an institution came into existence. One needed a very clear idea of what the proposed centre was meant to do. Then one needed to draft a detailed project report to tell the UGC what was needed in terms of infrastructure, human resources and of course, funding on a year-by-year basis

for the five years to come. Finally, one needed to find place for housing such a centre, preferably not very far from the GMRT centre that Govind was setting up. Having learnt the merit of parallel processing, I decided to proceed on all three fronts parallelly and not sequentially. I must say that in his capacity as Chairman, UGC, Yash Pal gave me his full backing. As a local contact for all our activities, he appointed Naresh as the Project Coordinator. Naresh joined on February 10, 1988 on deputation from the University of Poona. The University provided a room in the Golay Bungalow (the house of the former registrar of the university) for him to set up his office. Thus in an area of around 150 square foot, the budding centre took root.

To decide on the academic programmes of IUCAA, Naresh and I convened a few brainstorming meetings to which academics from universities and research institutes like the TIFR were invited. At this stage, my former student and later colleague at TIFR, Ajit Kembhavi also showed interest in the project and offered all his assistance in the planning process. This offer was indeed welcome as he represented the next generation of astronomers and his involvement would give the centre greater liveliness. We could see that what we were trying to put up was different from anything that existed either in India or abroad. We wanted to have the example of Abdus Salam's International Centre for Theoretical Physics (now the centre has been named after him) to guide us, for example. At the ICTP in Trieste, Italy, physicists from the developing nations come as associates to use the advanced facilities available there as well as to attend any pedagogical programmes set up by the centre. However, we also wanted IUCAA to be a vibrant centre for research in A&A and thus wished to follow the TIFR model too. Apart from these well established and distinguished institutions, we also wished to incorporate several other activities not normally found in a university or a research institute.

We ended up by arriving at what I called the "Eightfold Way" which incorporated the centre's activities. Thus it included basic research by academic staff who would be permanently at IUCAA and guide its academic programmes. It included interaction with the upcoming GMRT so that the university academics could also participate in its observing programmes. IUCAA would have its own Ph.D. programme and also encourage students from universities to participate in its graduate school or to use its facilities. Apart from the GMRT, IUCAA was expected to help university academics in writing proposals for using telescopes elsewhere in India and abroad and enabling their participation as guest observers. Like the ICTP, IUCAA also would have an associateship programme under which selected academics from universities

would be able to regularly visit the centre, stay there and use its facilities. Again, like ICTP, IUCAA would have an annual academic calendar of schools, workshops, conferences, refresher courses, etc. To encourage instrument building and observational astronomy, IUCAA would have an instrumentation laboratory which would guide university academics in instrument building under a do-it-yourself approach. Finally, IUCAA would set great store in astronomy education in general and would have a vigorous public outreach programme.

What facilities did we need in particular? To start with, a resource library was a must. It should have open-shelf access system and would also develop electronic component in response to the world-wide revolution in information technology. Then we needed a computer centre with advanced software for solving problems in astronomy and astrophysics. Again as the IT-facilities grew the centre would have state of the art local area network, electronic communication, data-transfer protocols, etc. The instrumentation laboratory would need basic optical and electronic work benches and instruments. Later it would be necessary to establish a data centre for astronomical objects. And, of course, we would need an efficient and adequate guest house and canteen facilities to house and feed the stream of visitors.

Given these academic activities and support facilities, what type of support staff would we need? We wanted to minimise on this count...bringing the ratio of support staff to academic and scientific staff down to 1.5 to 1 from the ratio 4:1 found in most academic institutions in India. To this end we were also advised by the UGC to rely as much on contract-staff for such activities as cosmetic maintenance, gardening, canteen, guest house management, etc. as possible, keeping the class IV staff to a minimum.

A related issue was buildings for the institute as well as for housing its staff. We wanted to have staff colony near the office buildings since many academics wish to work at odd hours and would find stay near the institutional facilities convenient. How should the buildings be planned and what they would cost? Clearly we were also keen to have a good architect to advise us.

All these issues were gone into in order to make a project document for the benefit of the UGC. This was ready and sent to the UGC by February 1988. Then came, for me, a moment of decision. I recall, receiving a phone call from Yash Pal. He came straight to the point: "I have got the project report. But I will move further to get the UGC's approval for the centre, only if you will take up the job and responsibility of its Founder Director." Till then I had not thought of actually leaving the soft-bed of TIFR to undertake the

arduous and uncertain task of institution building. The exercise I had participated in till then had an academic rather than a real practical status. Sensing my uncertainty, Yash pressed further, stating that he would like me not only to join but also not to leave any lien behind at TIFR. He was aware of many TIFR academics who had gone out to other institutions and universities only to return and exercise their lien. It did not take me more than a few seconds to tell him, that I was prepared to cut the gordian knot and take up his challenge. I only stipulated that I will be able to move to Poona after my second daughter Girija had completed her XII standard examination.

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Yash Pal set up an executive committee and a steering committee, the latter to give policy guidelines and the former to take specific decisions. The SC was a large body of some twenty members drawn from the academia and the UGC while the EC was a small subset of the SC. Both were chaired by the Chairman, UGC, so that their recommendations would be readily agreed to by the UGC. The centre was to be registered as a ‘Society’ with its rules and bye-laws. The UGC had been granted powers by the UGC Act of Parliament, section-ccc to set up autonomous centres of excellence under its ambit. However, the HRD Ministry would first need to approve the proposed centre.

Till the formalities were sorted out, the centre needed to have what Yash Pal called a ‘surrogate mother’, that is, it was to work under the umbrella of a university or an autonomous registered society. This role was naturally allotted to Poona University. In fact, the university had already welcomed the setting up of IUCAA and had promised co-operation in setting up the centre. So the university was requested to act as the surrogate mother. The then Vice Chancellor Professor V.G. Bhide readily agreed. As mentioned earlier, Naresh Dadhich was the first member of the centre, being inducted as Project Co-ordinator on February 10, on deputation from Poona University, while I received my formal appointment letter from the University to work as Honorary Director on July 19, which coincidentally was my fiftieth birthday. As I will mention shortly, this date also brought in another valuable present for me.

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One important decision that the EC had to take was to decide upon an architect, and here took place one of the happiest circumstances that I can recall in the

process of building of IUCAA. The story in fact dates back to December 1986, to the inauguration of another scientific centre, the Centre for Cellular and Molecular Biology in Hyderabad. The centre had been set up after meticulous planning by the biologist Pushpa Mitra Bhargava and with a flair for the grandiose, he had organized a conference of distinguished scientists and other intellectuals to mark the occasion. I had been invited to the meeting.

I was staying in the guest house of the centre and while at breakfast a tall and distinguished looking person got up from a neighbouring table to greet me. He was the architect Charles Correa, whom I had not previously met but whose fame had, of course, reached me. Charles introduced himself and over breakfast coffee, we had a short conversation covering cosmology, architecture and Cambridge. Charles was to visit Cambridge University as Nehru Professor. But more importantly, he was involved in the building of a centre in Jaipur which depicted ancient traditional astronomy. Charles was fascinated by old astronomy concepts, especially the 'Mandala'. Later he invited Mangala and me to dinner at his flat in Mumbai, where no less a person than Francis Crick was an invitee.

So when the issue of appointing an architect came up in 1988, I wondered, why not think of inviting Charles Correa as the architect. Would he agree? We had image of him as a person busy with grand and major projects and ours was perhaps too small a venture to interest him. But Naresh Dadhich and Ajit Kembhavi said that as I knew him, there was nothing lost in at least trying! So I picked up my phone and dialled Charles's home number. He was at dinner, but came over to talk. Would he consider IUCAA as a project for his involvement as architect? I put up this question after briefly describing what the centre was about and also that I had been placed in charge of it. To my great relief, Charles readily agreed. He was just completing the Jaipur project and to take up a project depicting modern astronomy presented to him a contrasting challenge that he welcomed. Charles not only brought his deep vision to the project but interacted well with Naresh, Ajit and me to know in greater detail what our vision about the centre was. To get a pictorial view of modern astronomy, I showed him my copy of the large Cambridge Atlas in Astronomy. He went and bought a copy and studied it from his own perspective as an architect.

On the next day I talked to Yash and informed him that Charles Correa had agreed to be the architect of IUCAA and may be formally invited to do so. Yash was also delighted and soon the SC and the EC ratified the decision.

Thus we succeeded in having a really distinguished architect to plan the centre's buildings and as we will see this decision was well justified by the outcome.

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So, early in 1988, steps were on the way to translate our brainstorming into a real centre. The most important issue still to be tackled was the question of land for the centre's building. Naresh and I were eyeing empty plots in the vast campus of Poona University, as ideally we would have liked IUCAA to materialize close to the GMRT centre. Here we found the university ambivalent towards the centre. It certainly wanted the centre to come about, but so far as land was concerned, it was reluctant to oblige. In fact, the VC was already facing criticism for agreeing to have the GMRT centre on the campus. If land were given away so liberally later expansion of the university itself would face a space crunch. So it was argued.

It was thus getting urgent to solve the land problem. How to solve it? I finally decided on a bold move. As member of the Science Advisory Council to the Prime Minister Rajiv Gandhi, I had had occasion to watch the PM at close quarters. I had been impressed by his urge to bring advances in science and technology to India and also his attitude to cut down paper-work and bureaucracy in general. Already at my request he had included an announcement of the proposal to establish IUCAA in Pune in his speech at the opening of the Indian Science Congress Annual Meeting in January 1988. [I later learnt that this announcement had brought some embarrassment to Yash Pal, since the UGC had not till then taken a formal decision on the project!]

So in March 1988, I wrote a letter to the PM stating that the centre he had announced had been approved by the UGC and was in search of land on the campus of Poona University. As there were numerous pressures on the VC, a favourable decision would need backing from higher quarters. Could he help?

I wrote this letter and then forgot about it in the midst of all other steps for planning the centre. I was also due to visit France from mid-April to mid-June as a visiting professor at the prestigious College de France in Paris. While I was preparing for the trip in early April, I had a phone call from the Chief Minister's Office in Mantralaya. I took the call and found that the CM, Shankarrao Chavan himself was on the line. He came straight to the point: "Did I need some land on the Poona University Campus?" In some trepidation, I replied in the affirmative, stating that it was for establishing a national centre.

"How much land do you need?" the CM asked. "Twenty acres". "That is nothing! Please come and see me so that we can sort it out. When can you come?" I was given an early appointment to see him.

Thus, barely a week before I was to leave for Paris, I was in the CM's office. Shankarrao Chavan was known to be an able administrator and he obviously had been contacted by the Prime Minister's Office. So he had been briefed to the extent of the information given by me in my letter to Rajiv Gandhi. He naturally needed to get further details before acting. After presenting my account, I mentioned that local interests and pressures may make it difficult for the VC to act on his own, which is why I had appealed to the higher level. The CM nodded and said to leave the matter with him and that he will ensure that I would get the required land for the proposed centre. He also mentioned that his secretary Mr DasGupta would keep in touch with me on this matter.

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I returned from the CM's office considerably reassured, although I did not expect the matter to be finalized till after my return from abroad in the last week of June. I asked Naresh to keep the matter confidential till the CM had acted and his office had issued a notification. Being a state university, all matters pertaining to Poona University would be ultimately dealt with by the State of Maharashtra and as such the CM should have the final say.

My trip to Paris went off successfully so far as its academic aspects were concerned. My local host, Professor Jean-Claude Pecker at the College de France, had made excellent arrangements for my and my family's stay and for my lectures at the College. He also had important responsibilities at the UNESCO which has its headquarters in Paris. So I mentioned the developments on the IUCAA front to him and he was very excited at the prospects of such a centre coming up. He promised to help formally and informally to promote our objectives.

While at Paris, I once had a phone call from Naresh, recounting some recent developments. Charles Correa had visited Poona to see the land which we had asked for from the Government of Maharashtra, so that as architect he could have some preliminary ideas on our buildings. As a courtesy, Naresh took him to see the Vice Chancellor. However, their encounter turned out to be a disaster. The VC categorically told him that it would be very difficult for the University to spare any land for IUCAA. Evidently, there had been no further development on the land-front since my last visit to the CM. To make

matters worse, Naresh mentioned that after the above encounter, he offered to take Charles for lunch where they could drown their discomfiture in drink; only when they went to the restaurant, they discovered that it was a ‘dry day’ because of a Muslim holiday!

Nevertheless, I told Naresh to keep his fingers crossed since the CM had made a definite promise. To make matters worse, in a minor political upheaval, the CM was changed and was replaced by Sharad Pawar. Did that mean we had to do our homework all over again? Then I remembered Mr DasGupta. Fortunately, although the CM had changed, DasGupta continued to be in his seat.

So, on my return from abroad, when I contacted Mr DasGupta, I discovered that matters had indeed moved. As he promised I was called to the CM’s office in early July and found that several bureaucrats were also present at the meeting. The CM asked me again for my land requirements. The bureaucrats from the revenue department assured that the land would be made available. They had identified the land and the CM assured me that this will be released soon by the Collector of Poona. He also said that it would be given on a 99-year lease at a token rent of one rupee per year. I was also amused to see that the concluding part of our discussion with us shaking hands was televised! That meant that the matter would be shown on the news channel of the state TV.

Ironically, the very next day I had an afternoon discussion arranged with the faculty members of Poona University. The purpose of it was to brief them on what IUCAA was about and how its arrival on the campus would benefit the University. Although there were several constructive remarks made, there were also some opponents of the idea stating that I would find it very difficult to get land for the centre on the university campus. Some even advised me to look outside the campus. Even though I was aware that the land issue was now *fait accompli*, I did not let out that item of news. Most probably, I figured, it would be on the TV news that very evening. It was.

The Collector’s personnel came and duly measured out the land that was promised. It was then discovered that the particular land admeasured only about 11 acres and we were still nine acres short. The Collector’s staff requested me to accept the available land of less area and ask for more as per the Government order. They assured me that the shortfall would be made up.

So it was that on July 19, my 50<sup>th</sup> birthday, that I had a meeting with DasGupta when he handed over to me the order for the land, stating that he will process the remainder soon. This did happen in due course, although we

got possession of the remaining plot of land by early 1989. While I was talking to DasGupta, there was a phone call from Delhi, which he answered. He was very deferential and I heard him say: "Yes Sir, he is right here and has been handed over the Government Order." It was then I discovered who in the Prime Minister's Office had been helping us all along. It was B.G. Deshmukh, the Principal Secretary in the Prime Minister's Office. Deshmukh had all along been keen to attract academic excellence to his city of Poona, and when the PM passed on my letter to him for further action he saw in it a project well worth encouraging.

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Once the land aspect was settled, the remaining major hurdle was to get the approval from the Ministry of Human Resource Development for the centre so that it could then be registered as a society. For this we needed the detailed project report approved by the UGC which would then be submitted to the MHRD along with a Memorandum of Association and Rules. The UGC approved the Project Report in July and played the ball into the MHRD court. Here, as per the experience of the Nuclear Science Centre (Now known as IUAC) a lot of time was excepted to be taken for this formality.

There were two aspects in which IUCAA was more fortunate. First, it was following on the steps of NSC with similar formalities and so by precedent we could get approval in a short time. The second reason was that the Secretary, Education, dealing with the matter was Anil Bordia, from the Rajasthan cadre of the IAS. He was friend of Yash Pal and also retained cordial memories of my father who had had a distinguished career as the Chairman, Rajasthan Public Service Commission. There were several road-blocks which he was instrumental in clearing fast.

I recall that early in November I had come for the meetings of the SC and EC and made my customary telephone call to Anil Bordia. He said: "I have just issued instructions that the approval note for the centre be formally prepared." This was as close as I could get to the end of the tunnel! During the SC meeting there was a phone call for Yash Pal from the MHRD Secretary. Yash went into his office to take up the call and returned beaming. "That was Anil Bordia. He informed me that the MHRD has cleared the matter and the Centre can now apply for becoming a Registered Society." We all applauded his announcement. Even though I had an inkling that this was imminent, the actual happening of the event was a great relief. I immediately requested Yash

to name a date when we would have the Centre's Foundation Day. He opened his diary and we arrived at December 29. Yash warned me, however, that registration of the society might take longer and in that case the Foundation Day may have to be postponed.

This caution on his part was based on the experience of the NSC in getting registration from the local authorities in New Delhi. Dr Patra who was the Founder Director of the NSC had mentioned how the New Delhi office of the Registrar of Societies had delayed the approval and I could only hope that his counterpart in Poona was kinder to us. After a couple of days, I received the formal communication from the UGC that IUCAA had been approved by the Government of India. The telephone calls from Bordia had been translated into written fact.

So soon after, Naresh and I went to the Office of the Registrar of Societies in Poona with all our documents: the Government approval, the MOA and Rules of the proposed centre, the letter of allotment of land from the Government of Maharashtra and asked with some trepidation as to the time the local authorities would take to register the society. We need not have worried! We were very cordially received and after inspecting all our documents the Registrar assured us that he would give the approval *within two days*. I could not believe my ears. Naresh rationalized on the way back that this difference of attitudes reflected the difference between an academic city like Poona which welcomed centres of learning and a political city like Delhi where power only counted.

On the way back I could not help wondering at our good fortune in promoting IUCAA from concept to reality. In September, 1987, Naresh and I had sat in Yash's office thinking aloud about IUCAA with nothing really achieved till then and here I was within fourteen months with land, architect, government approval, project document, rules and a registered society all set to go.

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However, looking ahead we had to launch the centre in a big way so that the academia knew of its coming.

On 29<sup>th</sup> of December, the newly registered centre was to have its first Council and Governing Board meetings. The Steering Committee and the Executive Committee stood dissolved automatically as the Centre became an autonomous registered society. They were replaced by the Council and the

Governing Board as newly constituted statutory bodies, by the Chairman, UGC. As Chairman, UGC, Yash pal was also the Chairman of the GB and the President of the Council. With his previous experience of similar bodies, he did not keep any minister or ministry official on these bodies, nor did he let in the Finance Advisor as a member. He felt that the proper place for the FA was in the Finance Committee where, as the finance advisor of the UGC he/she would scrutinize the budgetary proposals of the centre, which was mainly dependent on UGC grants.

This was a wise move. It has been the general experience that although having a minister as chairman might accord a special standing to the decision taken, very often because of the numerous commitments of the minister (and also his whimsicality or political instability!) the committee meetings do not take place regularly and important decisions remain pending. The FA also, in a characteristic way plays the role not of 'Advisor' but of 'Obstructor'. In some cases he exercises a 'veto' on important recommendations.

The first meetings of these bodies were held on the 29<sup>th</sup> December in Pune. As IUCAA did not have any buildings of its own, we looked for a suitable committee room nearby to the campus. Here Dr P. Chandrasekhar, the Director of National Informatics Centre came to our help and offered the committee room in his newly created building just outside of the university campus. At the first meeting I as Director was given full powers to run the centre within the financially pre-set budget. This autonomy was fully exercised by me and has proved to be one of the strengths of the centre. The architect's preliminary plans were also presented to the meeting. Amongst the special invitees, we had the eminent scientist Geoffrey Burbidge from the University of California at San Diego.

Perhaps I should take a brief detour from this account and comment that autonomy can be a source of strength if operated with responsibility. In many cases, heads of institutions or university vice-chancellors hesitate to use their powers for fear of being criticised later. Indeed there need be no fear of criticism if the steps are taken in the interest of the organization and in a transparent manner. I recall that the Joint Secretary from the UGC who was assisting me in framing our rules and bye-laws once remarked when I asked for his advice on whether to include a certain enabling clause in a bye-law: "Sir, do go ahead if you think that this will help the working of the centre. If you ask us (the UGC bureaucrats) we may not have the right answer and might say 'Don't' to be on the safer side." I took the hint and included several liberal provisions in the bye-laws which made the running of the centre a lot simpler.

After the meetings and lunch, we all trouped to the Golay Bungalow where the committee members signed the Visitor Book. Then we moved to the site where we had erected a small marquee under which was the foundation stone to be inaugurated by Yash Pal. He did so in the presence of the Poona University Vice-Chancellor Professor R.G. Takwale and myself standing near and of course all the invitees to the occasion, mostly from the neighbourhood. The stone was duly placed in a wall of the building in prominent position when the building was completed four years later. Yash Pal expressed the hope that this centre will provide the synergy needed by the academia from the university sector by bringing them together with active research workers in the field from India and abroad. I recall stating that several people had asked me as to why the particular day was chosen for the occasion, as to whether it was specially auspicious. My reply had been that any date or time may be considered auspicious for starting a good activity.

I wanted the programme to have an academic content also, and so had arranged a series of three lectures by Professors Burbidge, Radhakrishnan (Director of Raman Research Institute) and P.C. Vaidya (of Gujarat University). Burbidge, a distinguished astrophysicist, Radhakrishnan (the son of the Nobel Laureate C.V. Raman) himself a radio astronomer and Vaidya the doyen of general relativists in India provided their own perspectives on the challenges in astronomy and astrophysics that research workers in the field had to face.

The Foundation Day ceremony was simple and without any formal and artificial overtones. This was to set the tone for all future meetings to be arranged by IUCAA.

## IUCAA DEDICATED

WITH the Foundation Day on December 29, 1988, IUCAA had been initialized in principle. To establish it in practice as per its project document was going to demand ceaseless activity. Till then I had been making regular trips to Pune to look after its administrative progress. I had also used my direct phone line at TIFR liberally since it facilitated contacts with Delhi and Pune. By this time the communications revolution inspired by Sam Pitroda's C-DOT was unfolding and long distance telephony had become a lot simpler than a couple of years back. In short, the planning and execution of IUCAA-related jobs were much helped by the telephone and I could manage several things from Bombay in the 'action at a distance' mode.

However, the decision that I had been putting off till now, of making a shift from Mumbai to Pune could not be much delayed now. I consulted Mangala about a suitable date for the transition. One important consideration when families shift from one town to another is the education of children. Geeta, our eldest was well settled at the IIT, Mumbai and posed no problem in this regard. Our youngest, Leelavati was in the III standard in the Navynagar Central School. Although school change presents the stiffest problem in India, here transfer from one Central School to another was more or less routine. In any case when I talked to the Principal of the Central School in Ganeshkhind (nearest school to the university), I was assured a place for my daughter in the IV standard in 1989 June. The only possible problem that we anticipated was for our middle daughter Girija who was in the XII standard. Although she had

hopes of getting into the IIT, the outcome was not predictable. In any case, we felt that June 1989 presented a suitable date for our transition.

Accordingly I gave notice at TIFR after meeting the Director, who did try to persuade me to stay on. Nevertheless, since he knew that my mind was made up and I had given my commitment to Yash Pal, he did not press. I decided to encash my benefits (provident fund and gratuity) so that I would start at IUCAA on a clean slate. Amongst my many colleagues there was a genuine sense of loss at seeing me go. Some wanted to come with me to join IUCAA. In the end, Ajit Kembhavi, Narayan Rana and T. Padmanabhan did. However, one of my urgent needs was for a professional person in charge of the IUCAA library. Here Mrs Pramila Malegaonkar, an experienced lady on the TIFR Library staff offered her services. I was only too happy to welcome her and she proved to be a great asset in setting up the IUCAA library.

My parents had been all along very supportive of my involvement with IUCAA, although they had some reservations as to whether they would find the Pune winter too harsh. Although they had spent long times in Banaras, Ajmer and Pune in the past and had easily faced Indian winters, they had become used to the warm and temperate climate of Mumbai. Besides, advancing age (they were in the 75-80 age range) had made them less resistant to cold weather. Nevertheless they enthusiastically endorsed any plan we made to move to Pune. We decided accordingly to move on June 1, 1989.

There was a round of farewell parties from various friends and groups. The Theoretical Astrophysics Group had organized one in the West Canteen where several colleagues were present. The last such occasion was by the Physics Faculty at lunch on the day before we left for Pune. I recalled that my first occasion to visit TIFR in 1965 was in this very Faculty Lounge. There was a symmetry that brought me there on my last day at TIFR.

The transfer itself was quite an elaborate process. We had to pack and move pieces to be sent to Pune, give away those we did not want to carry and try to live with minimal furniture on the final days. We had sent my parents to Dadar with my in-laws ahead of this turmoil with the arrangement that they would travel to Pune by train after we had settled there. Likewise, Mangala's mother took charge of eight year old Leelavati and took her to Pune, much against her wishes. Geeta was in the IIT hostel as the semester was not yet over and only Girija was with us. There was a minor drama and tension when the trucks booked to carry our stuff on May 31<sup>st</sup> failed to arrive. Ajit Kembhavi, who was also moving with us that day and who had booked the trucks was very upset as there was no telephonic response from the truck company as to

the cause of delay. It was his wife Asha, who showed a rare enterprise by personally going to Raey Road area and making an alternative arrangement that worked. All the while our furniture and other items were stacked up in huge pile in the colonnade of the Bhaskara building. When I looked at that pile I wondered how all that mountain would be accommodated in two trucks. When the trucks eventually came and everything was efficiently packed into them, I still thought it a miracle.

There were several colleagues who dropped in to see us when we were spending the final night in the TIFR Guest House Ramanujan. I remember, in particular, the encounter with driver Mishra, who hailed from the Banaras district and had been keen to see me become director of TIFR in 1987. He broke down while wishing me well and also hoping that I would continue to be in touch with TIFR.

On this last count, there were several colleagues who felt the same and, in particular, Sudhanshu Jha was keen to see me made Honorary Professor. Thanks largely to his efforts, the TIFR Council approved my appointment as Honorary Professor for three years. Unfortunately, because of the heavy commitment of setting up IUCAA I was not able to visit TIFR as often as I wanted to.

On the early morning of June 1, we three, Mangala, Girija and myself took the TIFR jeep for the VT station to catch the Indrayani express. There was no one to see us off (- we did not expect anyone), but there were four student friends of Girija who had turned up at VT to see her off. The train reached Pune staion around 9.30 a.m. and Naresh was there to meet us with the newly purchased IUCAA ambassador car and newly appointed driver Jagade. We were also greeted by sporadic pre-monsoon showers.

We moved to a three bedroom flat in Aundh area which Naresh and I had earlier selected as my residence till the IUCAA Director's house was built. The flat belonged to Paul Ratnasamy, then Deputy Director of the National Chemical Laboratory. It was in Gulmohar Park area which was not so full of buildings and humans as it is now. Our luggage also arrived the same day and it took us two days to get everything in place. My parents and Leelavati joined us then.

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The foundation day marked the formal beginning of IUCAA, although we had already started academic activities on a modest scale with the facilities of Pune University and the GMRT centre. The buildings of the latter had started

coming up and the Founder Centre-Director Govind Swarup very kindly allotted to IUCAA members six office rooms. This was a boon considering the one-room office we had in the Golay Bungalow. For a time after joining and taking charge as full-time director on June 1, 1989, IUCAA's administration also operated from that room in the Golay Bungalow. I recall holding interviews for staff appointments in this room with the candidates outside on steps waiting to be called. The early appointees included Ratna Rao, Santosh Khadilkar, Rajiv Pardeshi and Niranjan Abhyankar, the last named managing our accounts. Mrs Malegaonkar had already joined and was busy arranging IUCAA books in a separate section of the GMRT Library allotted to us, again through the courtesy of Govind Swarup. My early recollections include Ajit Kembhavi and Mrs Malegaonkar waiting to receive the newly arrived lot of books in driving rain.

For assisting us in administration, Naresh and I had requested the University of Pune to make available to us on deputation the services of Suresh Panchwagh, who was a senior officer in the university registrar's office. This request had been accepted by the University, much to our relief since we needed time to look for a suitable administrator who would be in empathy with the dynamic academic character of IUCAA. Although we sounded Panchawagh as to his desire to join us in that capacity, he preferred to go back to his original position after the one year deputation period was over. After he left, we had Tarunaditya Sahay from the Institute of Armament Technology, who stayed with us until he left in 2002 to join the TIFR as Registrar.

My concern in those early days was to initiate a healthy academic programme that would grow with time, a programme that was aimed at universities. The GMRT was still a few years away from completion and although the telescope had been the primary focus for siting IUCAA in Pune, it could not be the sole aim. We had a broad strategy as outlined in the Eightfold Way to grow academic activity in A & A in the university sector. We needed a core faculty at IUCAA to direct its academic programmes, we needed experts from the various research institutes in astronomy and astrophysics to participate in our various pedagogical activities and above all, we had to generate a 'clientele' for our activities in the university sector. As a start on the third aspect, we began by holding a series of 'regional meetings' in different parts of the country. Typically we would select an institution or a university to hold a three-day meeting during which we would describe highlights of astronomy and astrophysics (A & A), the career options for the young students and the refresher facilities available at IUCAA to the existing faculty members. We invited

academics and senior students from the region (around 40-50) as target audience. We would also brief the audience on what facilities would be available at IUCAA, how they could use them to their advantage and also inform them of the modality of the associateship programme. These meetings played a vital role in getting IUCAA known all over the country and also getting us some first-hand views of the conditions prevailing in the university sector. Not surprisingly we were able to identify through this process, some promising faculty members who would gain by the IUCAA facilities and also some promising institutions wherein we could devote special efforts.

On the Foundation Day itself we had started on our core faculty recruitment programme. I already had Naresh and Ajit as IUCAA colleagues and to that list I added Sanjeev Dhurandhar who had come to astronomy from Pune University maths department followed by Ph.D. at TIFR under my guidance. Later he made valuable contributions to the area of gravitational radiation.

Yash Pal had very wisely asked two stalwarts in the education and research field to sit with me in a brainstorming on how IUCAA should function. Rais Ahmed, former Vice-Chairman of UGC and one-time Vice-Chancellor of Aligarh Muslim University and N. Mukunda, Senior Professor from the Indian Institute of Science in Bangalore were the two wise men. One message that clearly emerged from our brainstorming was that if IUCAA was to have credibility and authority in coordinating the A & A development in the universities, it needed to have a core faculty of active research workers doing excellent quality research in A & A, and at the same time willing to partake of IUCAA's various pedagogical programmes. To this end I was well supported in my search for high quality academic members for the core faculty. In this respect IUCAA opted to follow Homi Bhabha's philosophy in searching for good scientists and basing the academic programmes round them, rather than filling pre-assigned posts by the best available candidate. IUCAA had projected twenty academic members in its original project report...that number still has not been reached. The number even at the turn of the century was 13.

Yash had also stated that IUCAA should have a well defined academic programme which is made known annually at the start of the academic year. ICTP, Trieste has this tradition, but very few Indian institutes or universities do so. I am glad to say that very early on IUCAA began the exercise of publishing an 'Academic Calendar' at the beginning of July. Indeed, it would not be incorrect to say that it has been the first Indian institution to do so.

Another 'first' that IUCAA can claim is to have introduced a completely computerized card system for its budding library. Those were early days of the

IT revolution and pioneering work was involved in trying out a system that works. The computer-couple Mr and Mrs Gaikaiwari in Pune supplied us with the library software in 1989-90. In a certain sense, the feedbacks from the IUCAA library helped improve their computer programme.

Along with the library the computer centre was expected to be a major facility used by the visiting academics from universities. Here Ajit Kembhavi took on a major role in planning. He had already taken the responsibility for the library; additionally he now embarked on establishing the computer centre. Our first computer was from the Sun Microsystems, supplied by Wipro. But we also had to arrange its housing. We did not have temporary space in the GMRT centre as we had for the library. This need was compounded with the requirement of space for administration. Clearly the room in the Golay Bungalow was not enough to meet all our needs.

In fact by the time I had come to Pune, the activities of the centre had grown to a level where additional space was necessary. This led us to the major challenge faced by any institution in its growing up phase, viz., the construction of its buildings.

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As a temporary measure we needed some 2000 square feet of covered space at the earliest and we had decided to build a shed of that area to house our administration and the computer. This work started around March, 1989 and took around six months to complete and when it was ready in September, we moved our establishment from the one room in Golay Bungalow. It was an occasion to savour, for we were now having some area of our own for our work. It was supposed to be a temporary shed, but we got attached to it as time went on and kept it as a permanent fixture. At the time of writing we are using it as creche for children of IUCAA staff. Appropriately, it was named 'Aditi', the mythical mother of gods.

Charles Correa had been interacting with me, Naresh and Ajit and we had several sessions with him in which we aired our vision and he his way of transforming it into architectural reality. We broadly divided our construction plan into three phases. Phase I was to be limited to staff housing. Phase II would be for the institutional buildings while Phase III would be for the auditorium and the recreation centre. (Later we split Phase III into two parts and completed the auditorium first.)

Some academics from other institutions were surprised at my prioritization

for staff quarters. Why was I building staff quarters when the institution had hardly any staff? And, would not the institution's academic programmes suffer for lack of buildings? My reasoning (justified by events) was as follows. In general the staff housing takes a back seat in any Government supported institution. Very often funds allocated to the main office building are over extended and little money is left for staff housing. My own experience at TIFR is worth recounting in this regard.

As is well known, the TIFR was set up in 1946 and after temporary housing in a bungalow called Kenilworth in central Bombay, followed by a few years in the Old Yatch Club near the Gateway of India, it moved to its beautiful surroundings by the Arabian Sea. However, there had been no serious attempt to build staff housing and a student hostel for a long time. The first set of staff quarters on the new campus were completed in 1970. There were plans for bigger flats for the senior faculty to be undertaken next. When in 1971, I corresponded with the then Director M.G.K. Menon, he mentioned that bigger three bedroom flats would be soon under construction and I would be entitled to one of them. However, till then I could be accommodated in the first building built in 1970. I agreed. However, when in 1972 I joined TIFR, I learnt that no approval had still been received for the bigger flats although plans for them were all made. In 1973, however, there was a Government ban on the construction of all official staff quarters with the exception of those whose construction had reached plinth level. So TIFR missed the boat. Ironically, those three bedroom flats were finally approved and started being built in 1989, the year I left TIFR. Those who have lived and commuted long distances in Bombay will appreciate the advantages a staff quarter close to the place of work brings.

So, continuing my argument, once staff quarters have been built, one can approach the funding agency with request for funds for the office building, a request that cannot be denied since the office building is essential for the programmes of the institution. In the case of IUCAA, I figured out that the staff quarters would take one year to build and the office buildings two. Till the office building was built, the staff quarters would house institutional activities since the staff strength would be low in the early years. This is what actually transpired. In the early years, we had the library in one staff quarter, the computer centre in another, the canteen in a third one while a couple of quarters were used as hostel. The arrangement worked excellently. There was no quarter that remained unused.

Perhaps, it is worth disclosing some of the brushes I had with the CPWD whose role in the construction programme was minimal but still enough to

hold up progress. As per our procedure, the building committee was to have a senior engineer from the CPWD as a member. There was hardly a meeting in which he did not have arguments with the rest of the committee. His whole attitude was based on telling us what cannot be done, rather than how it can be done. Later I had him replaced by a member of the state PWD, who was much more in empathy with our vision.

The second point where we had problems with the CPWD was when we had to send our plans and estimates to them for scrutiny, to tell us whether they were reasonable. On the basis of the CPWD report the funding agency would release the funds. Now, as per our arrangement with Charles Correa, we had appointed the reputed firm of Shrikhande Consultants to supervise the day to day job of construction. As Construction Management Consultants (CMC), they were also responsible for making the estimates as per the architect's plans and for dealing with the job of tendering. The estimates made by this firm for our housing (Phase I) were close to, and slightly over Rs 1 crore. When the CPWD costed it, they came up with Rs 77 Lakhs only. We were surprised and examined the calculations given by CPWD. These assumed a cost per square foot that was unrealistically low; yet their claim was that if the work were given to them this would be the cost of execution.

I was at first in a dilemma. If I took the CPWD report to the UGC, their finance department would release only the CPWD amount, which realistically was inadequate. I then enquired with several government built institutions in Pune in recent years. I found that though the CPWD initially quoted a low rate to get the work, by the time it was executed the cost had risen considerably higher and the quality of work was not much to write home about. I collected some statistics and attached the same as my comments to go with the CPWD report. I had basically argued that to get the work done at the desired quality level, the cost estimates given by the CMC were realistic and should be approved.

I recall the day I went to UGC armed with documentation support for my case. I saw Yash Pal and presented the CPWD report and my argument. He saw the point and asked his finance people to see if they too agree with the higher estimate of the CMC. Within half an hour I had the approval. When the work was actually completed, the CMC estimate turned out to be very close to the actual expenditure.

We lost no time in initiating Phase I. Naresh specially wanted my father (his teacher at Pune University for the Ph.D.) to do the first ceremonial digging of the ground. This was done in early September. We used the tendering process with the two-cover system. After prequalification we chose the lowest tender.

However, the contractor turned out to be less able than our expectation. He took longer time than the originally estimated period of ten months, partly because some of the inferior work had to be redone by him at the CMC's instance and partly because he just did not use enough resources. Nevertheless, he managed to complete the Director's house for me to be able to move in on 9 January, 1991, the date chosen not because of any astrological significance but because of its symmetry : 9-1-1991. The rest of the staff quarters were completed progressively in the following six months. In early January we also surrendered the six offices that had been kindly lent us by Govind Swarup, as he needed them urgently. His GMRT centre was now formally named the National Centre for Radio Astrophysics (NCRA).

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However, in the beginning of 1991 I started experiencing serious discomfort not of a single nature but of a multiple one. These included weight loss, mild feverish condition, digestive problems, sharp chest pain after a meal, the problem of piles...the list was a long one. To add to it, I had a fall while practicing tennis on the newly laid courts of IUCAA. The pain in ribs which persisted for a while made us wonder if some bone was broken. I went for a check up by my friend and distinguished orthopaedic surgeon Sharad Hardikar who gave me 'a clean chit' saying that my discomfort in the ribs will gradually disappear.

This did happen eventually but the rest of my complaints continued to such an extent that I had to do my administration from home. At this stage we were advised to consult Dr H.V. Sardesai in Pune. He was known for his diagnostic acumen which was backed by knowledge and experience.

Dr Sardesai had a long session with me and sought all details of my medical history. And after listening to my account, backed and elaborated by Mangala, his eyes lit up. Like Sherlock Holmes homing in on the criminal, HV had confirmed in his mind what my problem was. He then proceeded to explain to me and Mangala. To describe it here I will briefly narrate my somewhat peculiar medical history.

In 1979, when I was in TIFR, it was my practice to play tennis in the morning. The courts were in our housing colony and one of my fellow players was Dr Jotwani, the medical consultant at TIFR. One morning Jotwani asked me how old I was. When he learnt that I had crossed forty, he invited me to come over for a routine but thorough check up. So I turned up at the medical section by mid-morning and the doctor started his check up protocol. All

went as expected with everything normal until the ECG. This was my first ECG in life but the doctor's face clouded as he looked at the output paper tape. Something was obviously bothering him and he repeated the exercise to be sure. Then he said: "There is something seriously wrong with your ECG and I must right away send you for thorough check up at the BARC hospital. We must find out why your ECG is so abnormal." In fact he was all for calling an ambulance right away until I argued with him that this was ridiculous since I was feeling quite normal, reminding him that I had played tennis with him that morning without any symptoms.

He relented and allowed me to go home to explain the situation to Mangala and return with an overnight bag for hospital stay. The experts at BARCH were also perturbed by my ECG and took several cardiological tests. They concluded that my ECG was abnormal but asymptomatic. They had a technical name for the condition: *nonobstructive cardiomyopathy*, I was told to periodically check my ECG for any change.

Later in 1980 when I went to Cardiff for a year's sabbatical, I had my ECG checked. The local GP on seeing my ECG thought that the Indian operative had placed the terminals wrongly. But when he saw the same effect in the Cardiff ECG he sent me to Dr Sheridan the local Professor of cardiology. He was also intrigued by the abnormality of the ECG and conducted several tests. He could not find any cause and asked me to be in touch with him whenever I visited the UK. In subsequent years whenever I went to the UK I used to drop in and report to Sheridan who later moved to London. There he also put me on a 24-hour ECG.

It was then that he suggested that purely as a precaution against irregular heart beats developing, he wanted me to take a drug called *cardaron* which had become available in the UK under the name *Amiodorone*. He wrote out a prescription so that I could buy it in London, as it had not come through to the Indian market. He explained that under my present condition this drug was not needed but was recommended as a preventive drug. So it was that from the summer of 1990 I had started taking that drug.

To return to the diagnosis by Dr Sardesai, what he pointed out was that this drug can have an adverse side effect leading to the thyroxin level shooting up. Looking at me with all my ailments he was certain that I had gone into hyperthyroid state. To confirm his diagnosis he got the relevant blood test done which indeed showed how correct he was. He said that although the drug had not yet been common in India, he had read about it and this side effect was known but not very common. He then stopped the drug and took

corrective measures reducing my thyroxin level in a controlled fashion and within two months I came back to normal. When I wrote to Dr Sheridan telling him the details of the episode he wrote back expressing his regret that albeit as a rare case I had to suffer but, he added that, I was fortunate that I had an excellent medical adviser in Dr Sardesai.

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The story of housing construction will not be complete without mention of the massive tree transplantation programme we successfully completed before the construction gathered momentum. We had several banyan trees mainly on the plot where the institutional buildings were to come up. These trees would have been cut down to make way for the buildings. To prevent this from happening, we felt that they could instead be transplanted to the housing plot, so that they would survive in their new surroundings. I recalled that when the new campus of TIFR was being built, Homi Bhabha had brought several transplanted trees to the campus. At the time one Mr Vaidya had organized the operation. Mr Vaidya had later been in charge of the gardens at the Bhabha Atomic Research Centre. I managed to contact him and requested him to visit us in Pune and advise us on this venture. He was only too delighted to come and he personally supervised the operation. A contractor specially trained for the operation was entrusted to do the job and he did it very well. I think, of the forty odd trees transplanted, only a couple did not survive the shock of moving. The result of this operation was that the housing campus, which earlier looked treeless had a lot of shady trees and many of the larger quarters had the advantage of having full grown banyan trees in their gardens.

I recall that when the students were asked to use their offices temporarily housed in the quarters just completed for IUCAA under Phase I, they raised a mild protest. The reason was that the computer centre was still housed in Aditi, which was some two hundred metres away from their new (temporary) offices. They felt that it was a long way to walk. I retaliated by telling them my own Cambridge experience as a research student of Hoyle in 1961, when I and fellow research students had to make a weekly trip to London for using the IBM 7090 computer there.

The arrival of IUCAA on the academic scene was almost parallel to the arrival of the IT-revolution and the e-mail. We were amongst the first to get on to the ernet-network and also negotiated an arrangement with the network to facilitate electronic communication with a few selected universities whose

academic staff were already using our facilities. The use of the e-mail was a boon since it helped us in quick communication with colleagues abroad and plan our academic activities fast. The invention of the fax machine also arrived in the late 1980s and we were the early users of this facility. When Yash Pal saw how effective the fax machine was, he asked IUCAA to get one for his use in the Chairman's office in Delhi. Our problem with the fax machine was that in those early days we had no one in India to send fax to! It took a couple of years for other institutions to catch up with us.

The Phase II was initiated in September, 1990 and we hoped to complete the institutional buildings in less than two years. With our hiccup with the first contractor, we were more careful in choosing the contractor for this phase. So we gave detailed justifications for not choosing the lowest bidders and ensured that the experience of the contractor would match the challenge of building something that would have visibility not only on the national scale but on the international one also. Contractor Bijlani filled the bill and we had a good working relationship with him throughout. The work was completed just in time for the planned inauguration on December 28, 1992, although there were a few anxious moments that I will come to later.

In the meantime I suffered a major personal loss. My father who had been progressively getting weaker had a fall and broke his femur. He was in great pain as he was admitted to the Joshi Hospital for surgery. However, on April 1, 1991, towards the end of the night prior to his scheduled operation, he passed away in his sleep. For my mother it was a great blow, but she bore it with fortitude. For me the accounts of the many occasions when he had been close to me kept rushing to memory. To enable people who knew him come and pay respects, his body was kept in our house till noon after which it was taken to Vaikunth Crematorium for cremation. He had stipulated that he did not want any religious rights performed. Although a deep philosopher and well-read on various religions, he was an agnostic.

My father had been a source of inspiration to me right from my childhood and he had stood behind me on several occasions of crisis. In building up IUCAA he had been very supportive to my efforts. I was happy when he moved with us into the Director's house and liked the environment. Alas he did not live long enough to have seen the completion of all of IUCAA's buildings.

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The Nobel Laureate astrophysicist Subrahmanyan Chandrasekhar (Chandra)

visited IUCAA first in 1989 when we hardly had any buildings up. But he was very pleased with the coming up of the centre, and I believe, enjoyed his visit. Except, possibly the lecture he gave. We had originally felt that his talk would be a technical one suitable for a seminar to limited audience. However, with the excitement of his coming, we were advised to have a larger setting as a large crowd may turn up. So we chose the Convocation Hall in the main university building as the place for his lecture. Seeing the crowds, Chandra was perturbed as he knew that most people would not understand his talk. Nevertheless he did not dilute it and gave it at its rigorous level.

I had been careful that involvement with the infrastructural concerns should not slow IUCAA down in its primary aim, that of creating an academic programme inhouse as well as for the university users. Even in the four years 1989-92, when we were using makeshift arrangements for housing the programmes, IUCAA arranged no less than 36 pedagogical meetings for the universities ranging from regional meetings, through to advanced research workshops, as well as summer/winter schools for students. We could attract several experts from the Indian research institutes and also some from abroad. Chandra's visit in 1989 had set the trend.

In 1989, we also had a workshop on instrumentation and observational astronomy and we were fortunate to attract Margaret Burbidge, the distinguished astrophysicist from the University of California at San Diego to the meeting. She and her husband Geoffrey Burbidge and some other scientists visited under the Indo-US exchange programme.

A memorable visit in 1991 was by Willy Fowler, Nobel Laureate from Caltech. We had arranged his public lecture in the amphitheatre of Fergusson College, a famous undergraduate college in the town. It was very well attended. However, as soon as Professor Fowler started talking, the power went off. This was one of those unscheduled power black-outs for which the Pune electricity supply is notorious. We discovered that there was no provision of a back up generator. Although we had one at IUCAA for such contingency, we did not think of bringing it to the college for a lecture. So we had to wait till the supply came back...Willy Fowler spent that hour or so chatting with the audience outside. Before he resumed his talk, I said in my introductory remarks that although in Maharashtra there is tradition at the beginning of an activity, of praising Lord Ganesha for undisturbed completion of the same, it would be more realistic to have an invocation to the electricity board!

Fowler was one of the five honorary fellows that I had requested Yash to appoint in the early stages of IUCAA. Our constitution provided for

12 Honorary Fellows who would be eminent academics whose association would be inspirational to IUCAA. This was a feature I had taken over from TIFR. The first batch of Honorary Fellows of IUCAA were, apart from Fowler, Tony Hewish, Subrahmanyan Chandrasekhar, Fred Hoyle and Abdus Salam.

Fowler's visit was indicative of the name the new centre was acquiring in the astronomical world. Its reputation for academic activity was beginning to attract good scientists from other places for talks, workshops, schools, and other pedagogical activities. Our records show that in this early period we had some 1500 academic visitors during the first four years. We also introduced the system of getting a new tree planted by a distinguished visitor, a tradition that continues to today.

It was one of the innovations in the Indian institutional background that I introduced in IUCAA's bye-laws, namely the concept of a statutory scientific advisory committee (SAC-IUCAA). Composed of eight members, with three from abroad, this committee is expected to carry out periodical reviews of IUCAA's academic performance and make constructive suggestions for improvement. Since the members are drawn from leading astronomy and physics institutions, they provide very useful inputs. The SAC-IUCAA earlier had a three-year tenure during which they met twice. Later, the frequency was reduced to twice in five years. The first SAC-IUCAA meeting took place in a modest way, in December 1989. It was attended by only two SAC members, Geoffrey Burbidge and V. Radhakrishnan, the Director, Raman Research Institute, Bangalore. Nevertheless, its impact was very much appreciated by Yash pal and his colleagues on the Governing Board. Later the SAC-IUCAA meetings and briefings lasted for 4-5 days and involved a thorough presentation of IUCAA's academic activities. This type of external review of a scientific institution is usual in the West, but was new to the Indian scenario. Some other institutions began to adopt this pattern after seeing the IUCAA example.

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While we were making excellent progress on all fronts, I was conscious of the impending retirement of Yash from chairmanship of the UGC. He had been a great supporter of IUCAA and I was anxious that his successor would also be one. I was very happy that the economist Manmohan Singh took the reins when Yash left early in 1991. He was very supportive of the IUC concept, but as events turned out, we were not to have the benefit of his leadership at the UGC for long. In the summer of 1991, the country descended into its worst

monetary crisis and he was invited by Prime Minister Narasimha Rao to be the Finance Minister and take urgent remedial measures. Manmohan Singh's dramatic steps taken at short notice, opening the country's economy are too well known to be narrated here. For us at IUCAA, his sudden departure from the UGC was just a couple of days before our Governing Board and Council meetings, the first that he would have chaired. In his absence the Vice-Chairman Khanna chaired the meetings. However, pending the appointment of a new chairman, a few crucial decisions had to be held over.

I should have mentioned Sudarshan Khanna earlier since he had been a live wire in the interaction of UGC with IUCAA in the formative early days. He was earlier the Secretary, UGC and later became Vice Chairman in 1990. His dry wit and ability to see above the normal bureaucratic walls had been a great asset to Naresh and me when we were planning IUCAA and later executing its project document. He got along well with Yash and so could take crucial decisions even in his absence. After Yash's departure and the later appointment of Ram Reddy as the Chairman, following Man Mohan Singh, Khanna became more detached from UGC's day to day running. He later took over the AICTE as its head.

I will not go into details over the two-year period of Phase II, which in fact stretched a little longer. But a few incidents need to be mentioned. Feeling that a set deadline would be a good way of putting pressure on all concerned, I approached no less a person than Subrahmanyan Chandrasekhar to deliver the dedication lecture of the centre towards the end of December. To my great delight, he readily agreed as he carried very pleasant memories of his earlier visit to IUCAA in 1989. As a Nobel Laureate scientist with seminal contributions to astrophysics, and an honorary fellow of IUCAA, Chandra was the ideal person to launch what we hoped to be a dynamic centre. After some exchange of correspondence, we decided on December 28, 1992 as the D-Day.

This was in mid-July, 1992. I was confident then that the Phase II (which was running about two months behind schedule) would be over by mid-November or so, thus giving us 5-6 weeks to plan the dedication ceremony. But, as Robert Burns said: "The Best Laid Plans O' Mice and Men Aft Gang Aglay", there were unexpected developments.

The first one came when there was a disagreement on payment terms between the CMC and IUCAA on one side and the construction contractor on the other. This led to stoppage of work for two weeks. The second came later when the central "Kund" was to be made. Correa had asked for specially

cut rough granite slabs to be brought from the quarry in Karnataka. The slabs were very heavy, the biggest ones would weigh as much as half a ton. They were to be brought on trucks and laid by crane in situ. Sometime the trucks were not on time, while once the crane itself collapsed. These events led to delays.

There is one episode which was captured by the Bangalore caricaturist Gujjar who had been invited by us to make a caricature of Chandra to be presented to him at the dedication ceremony. The work on the Kund was on and I had dropped in to do a spot-check of the progress. I found that the workers were sitting doing nothing whereas a pile of rubble was to be removed urgently for placing stone slabs. I got worked up and picked up a round tray for carrying rubble, filled it up and started moving the pile. Seeing me work, the workers got energized into action and began to work. Gujjar's caricature capturing this incident now hangs outside the Director's office.

But such pitfalls are common to any construction programme. What we faced next was totally unexpected. On December 6 the Babri Masjid was brought down by an angry and excited mob. This event had repercussions in India and abroad. There were riots in Bombay in December and amongst others the Muslim community in Mumbai felt threatened. Some of the fine wall-tiling work at IUCAA was to be done by Muslim artisans in Mumbai. They refused to move out of their houses for fear of danger to their life. We anxiously waited for the situation to improve, but the date of the ceremony was drawing near. Finally, around Christmas, with a couple of days to spare, the artisans arrived. They promised to work day and night to complete the work before 28<sup>th</sup> December. I left them at work late in the evening of the 27<sup>th</sup> with the front wall tiling half done. Charles Correa was also watching anxiously for the work to be over. The next morning the work had indeed been completed. So we really had cut it very fine.

The architect had planned to have large statues of four scientists Aryabhata, Galileo, Newton and Einstein to be made in Mumbai and placed in the Kund area. This work was by Patkar from Bombay which just got completed in the final days. The interior furnishing work of many buildings was also done just in time as the interior consultant had a tragic bereavement in the family. But on the 28<sup>th</sup>, we had almost reached the final stage to a level that made it possible for the ceremony to take place in a tidy environment.

There was another last minute problem. We had assigned a deaf and dumb artist with the job of making a scale model of the entire IUCAA campus. The model arrived and was duly placed in a prominent position. However,

when Charles saw it, he blew up! There were several discrepancies with the original that needed to be corrected. He refused to have the model on display till the defects were rectified. As he had a point, but the model per se looked beautiful, we arrived at a compromise. The model was shifted into a side corridor, away from its prominent place.

Then there was the airline strike which had grounded many flights. We needed Professor Ram Reddy to arrive in time for his presiding address. His office could make no progress with the bookings. However, our travel officer, Lata Shankar achieved the impossible: she managed to get him a ticket to board one of the few flights running between Delhi and Mumbai. Chandra's flight had, fortunately, not been affected by the stoppage.

So it was that we finally had all things (and people!) in place and the ceremony went off well. The 500-strong audience was seated in the kund on a fine winter evening. The dedication itself was effected through a mechanism which I believe was (and still is) unique. We had a Foucault pendulum installed in the main wing of the building. It oscillates for ever, being energized periodically by an electric circuit. As it oscillates, its plane of oscillation steadily rotates about the vertical to keep pace with the spin of the Earth. This model, the first working model in India, had been fabricated for us by the National Council of Science Museums and forms one of several scientific exhibits placed all over the IUCAA campus.

The idea that a Foucault Pendulum should be a centrepiece of the institutional building had come from Mangala, who had seen similar models in the Pantheon in Paris and the Smithsonian in Washington. The pendulum serves to remind us of the basic astronomical fact that it is the Earth that spins around its axis and the rising and setting stars (including the Sun) are in fact stationary. Mangala's suggestion was indeed very appropriate for an astronomy institution and Charles Correa immediately followed it up trying to understand its basic principle in discussions with Ajit and me. Indeed he was so taken up with the idea that he presented Mangala and me with a copy of Umberto Eco's novel with the name '*Foucault's Pendulum*'. This exhibit played the key role in the act of dedication, which was carried out by Chandra pressing a switch that released the bob of the pendulum which then started to oscillate.

In his dedication speech, Chandra spoke on the haystacks paintings of Claude Monet and the landscape of general relativity. He drew analogy between the haystack paintings in different shades and seasons and the different applications of the same relativistic equations to such bizarre systems as spinning black holes and colliding gravitational waves. The audience may have captured

the basic idea, although the details would have been beyond all but a few experts in relativity theory. Prior to the talks by the Chairman, UGC and Chandra, there was an invocation in sanskrit from one of the rooftops around the kund which had a profound impact under the setting sun.

After the ceremony, we had a sit-down dinner for a few invitees in my house to meet Professor and Mrs Chandrasekhar. As the evening wore on and the activities for the dedication went off smoothly, I had one regret amongst the overall feeling of satisfaction about the ceremony. My father was no more. He would have been very happy and gratified by what had been achieved and I would have been specially happy to have received a pat on my back from him.

## IUCAA CONSOLIDATED

THE distinguished guests departed soon after the dedication ceremony. Apart from Chandra and Ram Reddy, these included the members of the Science Advisory Committee which had its third meeting around the time of dedication. We had Yash Pal delivering the third Foundation Day Lecture. This lecture, to be delivered every year by a distinguished scholar on the Foundation Day (December 29), had been introduced in 1989. Govind Swarup was the first speaker, followed by P.N. Haksar in 1990. This lecture has attracted cream of intellectuals to IUCAA on this day. As far as possible, the mid-year meeting of the Governing Board is held on this day also. To mark this day as a family celebration, the IUCAA staff and families usually put up an inhouse entertainment programme followed by dinner.

I was aware that the Dedication Day symbolized the end of IUCAA's major construction phase and the beginning of consolidation of IUCAA's academic programmes. Support from the local infrastructure was very crucial for these programmes. It was important therefore to sustain the dynamism that had become the visible qualification of IUCAA and to ensure that the infrastructure staff would continue to give its dedicated best to the organization. The visitors from India and abroad had high praise for the local infrastrucure, which they found very efficient and quite unlike that in any government department or government aided institution. In fact, to do justice to such dedication there needs to be a reward system or a promotion policy that encourages high quality performance. Although we at IUCAA tried on several

occasions to introduce an incentive based policy our attempts were thwarted by the Government and UGC bureaucrats, on the ground that such a system did not operate in their organizations and departments, and if it were introduced at IUCAA, it would have to be offered to all government staff; and that would be a very expensive proposition. Nevertheless, IUCAA has managed to provide some incentives that have kept the support staff reasonably buoyant.

The scientific advisory committee of IUCAA (SAC-IUCAA) had emphasized that our academic component could be strengthened despite the slow growth of the core faculty, by inducting more post-doctoral fellows. So, instead of five, we raised the number of post-docs to around ten. In some years the number has exceeded ten also. This turned out to be a good step. As IUCAA's name became known worldwide, we have had post-docs even from abroad. They usually do not stay longer than a year or two. But they bring an extra variety to the life at IUCAA.

To get IUCAA known internationally we organized some high profile meetings soon after our dedication ceremony. In 1993, we held the 6<sup>th</sup> Asia Pacific Regional meeting of the International Astronomical Union. The meeting was to be held from August 16 to 20 and we had arranged for the 500-seater auditorium to be completed under Phase III of the construction programme by that date. As in the case of Phase II, this deadline worked but proved to be another cliff-hanger. The auditorium was just completed in the previous week and I delivered a trial lecture on the Saturday 14 August under our newly introduced school-children's programme (see later in this chapter). In 1994 January we organized the International School of Young Astronomers which was a great success. There were other international meets in later years like the Indo-French workshop, the Indo-US workshops, the Sino-Indian school, etc. The successes of these meetings resulted in IUCAA getting well known in the astronomical circles abroad. In 1997 IUCAA successfully organized GR-15, the 15<sup>th</sup> International Conference on Gravitation and Relativity which brought in 500 participants.

Another reason for IUCAA's recognition was the high quality and high profile work by its academic core faculty, post-docs and students. In this connection, I recall an incident in 1989 in Bangalore.

This was a meeting to review the overall performance of astronomical facilities in India and the projection of new ones, including recommendations to the Planning Commission for any major telescope or instrument. At the time on behalf of IUCAA, myself, Naresh, Ajit and Sanjeev Dhurandhar, who had just joined, had participated. We had projected our vision of IUCAA and

Sanjeev made a case for a facility for gravitational wave detection and data analysis. This last was based on our perception of the growing field of gravitational waves internationally. While the presentation was considered interesting, some ‘elder statesmen’ present made patronizing comments to the effect that IUCAA should not get into major areas till it had established its credibility. I had been hurt by such comments, which, to me, indicated a lack of confidence in the younger generation.

Against that background, Sanjeev took 3-4 years to establish IUCAA’s name as one of the few places where leading work on data analysis of gravitational wave signals was taking place. Several of his research students, after doing their Ph.D. at IUCAA, were placed in major facilities in this field worldwide.

Structure formation and cosmology was another area in which IUCAA could boast of leading talent. T. Padmanabhan, formerly my student at TIFR, and Varun Sahni who had joined from the Canadian Institute of Theoretical Astrophysics (CITA) are the leading lights in this field. Their students have also received post-doctoral appointments in important centres abroad. Other areas of special note have been classical general relativity and quantum gravity, spectral classification of stars using neural networks, morphology of galaxies, etc. My own interests lay (and continue to lie) in the area of alternative cosmology, about which I will have more to say.

An important component of IUCAA is its instrumentation laboratory, which was designed to help the university academics in building instruments of astronomical nature. I needed a dynamic person to head this lab and was more than pleased when I could follow SAC-IUCAA’s recommendation and attract Shyam Tandon from TIFR to head the laboratory. A hard taskmaster, Shyam has been able to bring instrument-building culture to several universities.

I recall that in the fourth or fifth meeting of SAC-IUCAA, the external members expressed the view that although IUCAA was on the way to attaining reputation on an international level, it had still some way to go before it could be ranked amongst the world’s top ranking A&A research institutions. However, some three years later, another SAC-IUCAA which contained amongst its members no less a person than the President of the International Astronomical Union, did admit that IUCAA had indeed reached that level.

In this connection, I was specially pleased to point this out to Mangala, my better half, who earlier used to say that “IUCAA may attract considerable accolades for its beautiful campus: but does it attract similar praise for its scientific output?”

This is perhaps the place to say a few words on the IUCAA campus. I have mentioned that while designing it we had intensive discussions with the architect Charles Correa, who studied astronomical literature especially from the point of view of having a campus that gave expression to the dynamism of modern astronomy. We were in tune on one point that we should have large and small exhibits distributed over the campus to illustrate astronomy and mathematics in general.

The housing campus was named 'Akashganaga' for the Milky Way, the galaxy we reside in. The Sun is one of the more than hundred billion stars that belong to the Milky Way. The large galaxy next to the Milky Way is Andromeda and accordingly we named the adjoining complex of institutional buildings, 'Devayani', the Indian name for Andromeda. The next complex of buildings containing the auditorium is called 'Aditi', as it contains IUCAA's first building, namely the shed with the same name.

There were separate but connected blocks in the Devayani complex which were named as 'Aryabhata', 'Bhaskara', 'Varahamihira' and 'Brahmagupta', four great Indian astronomers: the first one having a statue also in the Kund. Aryabhata is the main block which houses offices of the Director and other academic members, administrative staff and visitors. The Bhaskara block has three lecture theatres of varying audience capacity, 50, 80 and 110. Next are the Varahamihira block of the library and the Brahmagupta block housing the instrumentation laboratory. Another block that remained to be named in this series was the canteen. I found an apt name for it from Indian mythology, *Ballava*, the name taken by the Pandava prince Bheema when he was required to spend a mandatory year in disguise as a cook. The canteen displays a proud quote by Savarain the famous Chef that for human happiness the discovery of a new dish is more important than the discovery of a new star.

The Guest House is attached to the Aryabhata Block on its western end and is in the form of a square with cloister-like verandah. It has been named 'Nalanda' after the old Indian university of the first millennium A.D. in the eastern province of Bihar. Attached further to it on its western end is a series of flatlets for visiting scholars which has been named 'Takshashila' which was another ancient university in the North-West frontier of the Indian subcontinent (now in Pakistan). By a happy coincidence, I discovered when on a visit to the ruins of the old Nalanda in Bihar that the size of a typical residential unit of this old university was very close to the size of our Nalanda block!

The layout of the Devayani complex is in the form of three squares joined along a diagonal as axis. Each has a courtyard. When brainstorming with Charles

we wondered what these courtyards should contain. Finally we arrived at the present layouts. The Nalanda courtyard houses a Sierpinski's gasket, which is a fractal triangle. The notion of fractals has been considered important in several natural formations. In a way it describes structures whose dimensionality is not limited to the integral values of one (line), two (plane) or three (solid block), but can be fractional. The dimension of the Sierpinski's gasket is approximately 1.8928. It will take me too far from this narration to describe the concept in detail. I may add that the gasket was landscaped in the courtyard with orange trees in the empty areas.

The main and the largest square is the central one housing the Kund. It was designed to give openness to the building complex and to provide space for groups big or small to meet together for informal discussions. We had the option of putting a lawn in the base of the Kund. However, we were more adventurous and have landscaped the area with a schematic plan of a radio source in which twin jets emerge from a central disturbed and highly compact area, usually believed to house a black hole.

The third and the smallest courtyard is between the Brahmagupta and Varahamihira blocks. It originally housed two banyan trees. What to do with them? In the normal course of building these would have to be destroyed. However, as mentioned earlier, we had saved a number of trees on the building plot by transplanting them. We could have included these also in that list. However, Ajit had a better idea: why not use them to depict a binary star system? In a binary system the two stars move round each other and there are regions where the 'gravitational potentials' (the levels measuring the strengths of gravitational field) are the same. We assumed the trees to be the two stars and estimating the ratios of their masses we landscaped the equipotentials. There are some points where there is no net force. Such points, called the Lagrangian points are also marked as  $L_1$ ,  $L_2$ , etc.

Thus one may observe that the IUCAA exhibits are fairly sophisticated and try to bring some interesting and deep aspect of nature or cosmos in a landscaped form. There were other exhibits too, some of which are described next.

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The first one to be made was the Foucault Pendulum that was used so dramatically in the dedication ceremony. The pendulum is based on the model first popularized by the nineteenth century scientist Leon Foucault. His pendulum was hung from the tall ceiling of the Paris Pantheon. The pendulum

is free to oscillate in any vertical plane. When set oscillating in a given plane, it is found that the pendulum slowly rotates its direction. If the pendulum were set up on the North or South Pole, its plane of oscillation would spin around 360 degrees in twenty four hours. At any other place the period of rotation is longer, depending on the latitude of the place. In Pune the period is around 75 hours. That is, if you see the pendulum after the time-gap of seventy five hours, the direction of oscillation of the pendulum would have turned through an angle of around 360 degrees. The pendulum thus provides a demonstration of the spin of the Earth. It was natural therefore that we should place the statue of Aryabhata in the Kund, out in front of this exhibit. For, Aryabhata had made the assertion that (contrary to the prevailing dogma in the fifth century India) the star background is fixed and the Earth spins from west to east.

In the auditorium which has a capacity of a little over 500, and which was named after Subrahmanyan Chandrasekhar as the Chandrasekhar Auditorium, there is a small kund and its base has a rather unusual tiling. The tiles are pentagonal but with unequal edges. They are identical in shape and size to two basic shapes which are mirror images of each other. But the remarkable fact is that they fit into one another to cover the plane surface. The distribution is called *aperiodic* to emphasize the fact that it does not repeat itself after regular intervals. Originally popularised by the mathematician Roger Penrose, it serves to illustrate the unexpected.

But perhaps the most talked about exhibit at IUCAA was the descendant of Newton's apple tree. Legend has it that Newton was prompted to think of the law of gravitation by the drop of an apple on his head as he sat under the apple tree in his garden. The legend, popularized by Voltaire, has not been authenticated by Newton's biographers. However, it is established that there was an apple tree in Newton's garden in Woolsthorpe Manor, and that he often sat under it and also sometimes discussed matters with others. That historic tree survived Newton and lasted until 1820 when it was destroyed by lightning in a thunderstorm. However, the grafts from the tree survived and were propagated first at the Royal Botanical Gardens at Kew and then eventually at the Brogdale Horticultural Trust.

While delivering a seminar at the Anglo-Australian Observatory and the CSIRO of Australia in the early 1990s, I showed a slide of Newton sitting under the banyan tree in IUCAA's Kund, with a fallen apple at his feet. "The problem Newton seems to be worried about", I jocularly remarked, "Is, why has an apple fallen from a banyan tree." This produced audience laughter, but at the end of the seminar, Ron Ekers (who later became the President of the

IAU), accosted me and said: "You can actually plant an apple tree behind Newton, in fact you might try to plant a descendent of the tree from Newton's garden". He later sent me an account of how CSIRO did it despite Australia's stringent laws against bringing outside plants into the country. This spurred me on to my own quest which eventually led me to the Brogdale Trust in England.

The quest was, however, more prolonged. The Brogdale Trust was very forthcoming in supplying us with plants. The first attempt was through no less a 'courier' than Fred Hoyle, who was to visit IUCAA in February 1994. He brought three saplings with him. We planted them in the Kund area. But, alas, they did not survive the Pune summer. In fact several horticultural experts discouraged me from the effort saying that the apple plants would not survive in Pune; that they need a hill station like Shimla or Manali for growth. But I persisted. The second time we had the plants sent as grafts by post. Unfortunately, thanks to the bureaucracy of the Foreign Post Office in Mumbai, we were asked to collect them from the post office about a month after they had arrived. Although the grafts survived for a month or so and one of them even flowered, they all died in summer. Our third attempt was to be eventually rewarded with success. But here another problem cropped up. The grafts could be shipped only after we procured a 'no objection certificate' from the concerned authorities in Delhi. This aspect, apparently had not come up in our earlier two attempts, but was now required by some changes in law. I almost gave up, when I recalled that I had Vinod Chopra as a colleague on the erstwhile Science Advisory Council to the Prime Minister. He was the Director of the Indian Agricultural Research Institute. He readily came to my rescue and arranged to deal with all the formalities in Delhi and thus three more grafts arrived in Pune. We planted one sapling behind Newton, another behind Einstein and the third one in the Science Park.

This time I had been wiser in arranging a protective roof on the plants during summer. They lasted and grew. My earlier skeptic friends now said: "The plant may grow in the Pune weather, but it will not give fruit." The trees proved them wrong again. The tree behind Einstein began producing fruit every year. The other two flowered, but we did not get any fruit from them. The tree in Trinity College, Cambridge was planted in 1954 and fruited only in 1970.

However, a sad postscript remains for the episode. After about ten years of fruiting the tree near the Einstein statue died suddenly, possibly from some insects attacking from within. The other two trees also followed suit. So we

have decided to test the probable planting area first before experimenting with fresh saplings.

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I can take pride in the fact that IUCAA was most likely the first advanced national research centre to have a dedicated programme of science popularization. In our project document we had put it up as one of the centre's aims to bring science to the masses, especially to school students. We did not want IUCAA to appear as an 'ivory tower'. I was considerably pleased when the venerable TIFR also followed suit a few years later and had its own public outreach programme.

IUCAA's science popularization programme started even before we had all our buildings. On February 28, 1990 and in later years we have had celebrations of the National Science Day. In the early years, it was Narayan Chandra Rana who led the IUCAA efforts to create a stimulating programme for school children. He had joined from the Theoretical Astrophysics Group in TIFR and despite a weak heart and a pacemaker, he led dynamically from the front. His untimely death in 1996 (from extending himself too much) was a serious loss to IUCAA.

Apart from the Science Day, IUCAA instituted a lecture programme for school children from the year 1993. Every second Saturday we would have two lectures, one in English and the other in Marathi or Hindi, for children from 8<sup>th</sup> or 9<sup>th</sup> standards in schools in Pune. The auditorium tends to be full (sometimes overflowing) for these lectures. Thus by the time of writing more than a lakh of students would have been to these lectures. The speakers are drawn mostly from the IUCAA faculty and visitors, some from other institutions in Pune. They pitch their talks at the appropriate level, but the topic is not from the standard textbook. These lectures are meant to widen the scientific horizons of the students (and the teachers).

Apart from this, from 1994, I introduced another programme for the school summer vacation. Over the 5-6 weeks of the vacation period, each week IUCAA invites school children to do a one-week project with some academic member. The students come at around 10 a.m. and leave at 3.30 p.m., Monday to Friday and work on their projects. Thereafter each student, or group of students (if they are working as a group) presents a report on the project. Around 125 students take part in this programme and since its inception, around 1500 have taken advantage of it.

Apart from this there is a continuous programme under which those interested in instrumentation at IUCAA interact with the amateur astronomy community, including occasional workshops for making telescopes. In 1991, IUCAA organized a national meet of amateur astronomers with the aim of uniting their movement into a single national body. As a result of these efforts a Federation of Organizations of Amateur Astronomers came into effect with guidance of N.C. Rana of IUCAA.

There are public lectures both in the Chandrasekhar Auditorium as well as in various lecture rooms in the town where distinguished visitors to IUCAA present highlights of their fields to the general public. The list of such speakers would by now hit a century.

IUCAA's efforts have received accolade from the general public to the experts, including from the SAC-IUCAA. The International Astronomical Union has taken note of it. A high point was in 2003 when President Abdul Kalam made an informal visit and spent more than an hour visiting IUCAA when he also interacted with the school children.

However, an unexpected pat in the back for the programme came when Smt Sunitabai Deshpande, made a handsome donation to IUCAA to set up a children's science centre. Her husband the renowned P.L. Deshpande gave enthusiastic support to this idea while he was alive. After his death, the building built from the donation in 2004, named *Pulastya* came up to house the Muktangan Vidnyan Shodhika (Science Exploratorium). The name of the star in the group of seven called 'Big Bear' echoes the Marathi initials of P.L. Deshpande. The MVS is already popular with visiting school children, thanks to the charismatic Arvind Gupta who is well known for his lectures around scientific toys.

To oversee these programmes I had set up a Science Popularization Committee of interested academics at IUCAA. This committee looks at various innovative ways of bringing science to schools. For example, the use of the internet was made in a novel way when by remote command school children at IUCAA could operate a small telescope at Mount Wilson in Southern California. Because of 12.5-13.5 hour time difference between Pune and Los Angeles, the night sky in California is available to viewers in Pune around mid-day to early afternoon.

The open area around the auditorium received a new set of exhibits when the science park was set up in 1998. This park has open air models to demonstrate interesting aspects of physics, mathematics and astronomy. It also has a replica of the famous maze at the Hampton Court Palace outside London.

The National Council of Science Museums (that had made the model of the Foucault Pendulum for IUCAA) has been responsible for setting up many of these exhibits.

The National Science Day event has grown in size and variety over the years. With one day for school children we have another for general public and around 10,000 persons come to see what goes on at IUCAA. At night we also organize sky-watching with telescopes brought in by several amateur astronomers. The programme has long queues.

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I had expected considerable headache running a centre like IUCAA. Research centres or universities in India are notorious for the worries they bring in for the person at the top. I was pleasantly surprised therefore when after a few years' experience I found that running IUCAA did not take up much of my time: I would put it at about 20%. The rest of my time I could do my own creative academic work including research, writing, teaching, guiding students, etc. This statement has surprised many directors and vice chancellors and so here is my recipe!

Basically it helps if the person at the top delegates responsibilities to colleagues at various levels. In the first year itself, I did this, including giving them financial powers. In case of misuse or advice for action, I was of course, available. However, no instance of misuse ever came to me. The responsibility entrusted to an individual brings with it a sense of maturity. In the few cases where decisions taken by my colleagues created some unhappiness to concerned individuals, I went into the details. If the decision was wisely taken (as happened in most cases) I backed it. In the few cases where it had to be over-ridden, I took the colleague in confidence, explaining why I was doing so.

I recall, one head of a major organization, who, upon taking charge, took away all powers from his subordinates and took them upon himself. He did not trust any colleague and wished to demonstrate to all where the power in the organization lay. One day I had to talk to him on phone on a Sunday. I called his residence and was informed that he was working in his office. When I called him there and expressed surprise that he was at work on Sunday, he said that his desk was so full of files that he had to come even on weekends to clear them. Apart from demoralizing his colleagues he had brought upon himself a mountain of decision making that could very well have been entrusted to others.

In fact, I experienced as Director, greater stress from my role as mediator between petty quarrels of my academic colleagues. This symptom is perhaps more pronounced in an institution of scientists. For, scientists regard themselves as rational beings and each one feels that he or she is right in any argument with a colleague. Such arguments often come to the Director who has to resolve them in a manifestly bi-partisan way. Although I had a measure of success in resolving such quarrels, after each such exercise I used to feel unhappy that such matters arise amongst mature and supposedly objective persons.

My major administrative meetings were those of the Council, Governing Board and the Finance Committee. As per our bye-laws the Senior Administrative Officer kept the minutes of the last meeting while I kept the minutes of the first two. In the Finance Committee we had to project our future expenses and budgets, justify the amounts spent and also reply to any queries of auditors. The auditors were of two kinds: the internal auditor sent by the UGC and the auditor appointed under the Societies' Registration Act. The latter usually posed no problems, but the former often did. In a few cases when the internal audit team came to see me with their comments I asked them as to why they were raising objections on various petty issues. They invariably confided in me that our accounts were in excellent conditions, but as auditors they were bound to take objections on some matters, howsoever trivial they may sound, so as to justify their existence! Likewise, at each finance committee we had to face the comments made by the Finance Advisor. We could easily make out which comments were serious and required our thorough reply, and which were raised just to be obstructive. Most FA's we encountered were reasonable and could understand and appreciate our arguments. There was one hard nut we encountered who seemed to take delight in making us reverse our decisions. I will come to a specific case in the next chapter.

So far as the Council and GB were concerned, my colleagues used to joke that I wrote the minutes of the meetings *in advance!* This may be an exaggeration, but it was not far from truth. What I did was, to write in advance the main text of the minutes in which each agenda item was described and left the operative part of the decision taken to be filled in after the meeting. Very often I used to put in advance how the argument went (-or, rather would go!), based on my knowledge of what each member would say. This very often turned out to be right. In the day and age of word-processing, this made the final draft easy and quick to complete. So, within an hour or so of the completion of the meeting I would be in a position to present my draft of the minutes to

the Chairperson for his / her approval. In almost all meetings, I was able to get the approval of the minutes very soon.

Regarding promotions, appointments, and other matters which required the GB approval through circulation, I used to send copies to all members and requested them to respond within a month on the prescribed form. I also stipulated that if no reply was received before the stipulated period, I would assume that the member agreed with the proposed decision. This method worked with all GB members except the bureaucrats from the UGC. A typical bureaucratic response is to sit on the decision and to expect a string of reminders before acting. They were unhappy with my approach but as the Chairman, UGC went along with it, they did not object in writing. The result was that all matters to be decided in circulation were handled promptly.

Nevertheless, there were occasional anxious moments pointing to a crisis when the UGC grant did not arrive on time and our balances were running low. This necessitated urgent phone calls from Pune; but usually the crisis dissolved soon. On the whole I must admit that I found the bureaucracy at the UGC quite cooperative.

A few years on, Ram Reddy, the then Chairman, UGC asked that the rules and bye-laws be revised so that the chairman of the Governing Board is chosen to be an eminent scientist rather than the Chairman, UGC. This decision was to affect all the six Inter-University Centres (IUCs) in existence. As directors we had mixed feelings on the issue. Having the UGC Chairman as the Chairman of GB implied that any decision taken and approved by him in the GB would be accepted by the UGC. This likely facility would be gone if some other person chaired the GB. However, Ram Reddy argued that in principle, when he approves a decision on the GB, he does so from the point of view of the IUC. The same decision would have to be looked at again by him as Chairman UGC and the approval is not automatic. He further cautioned that it may happen that some future Chairman, UGC may not be appreciative of what the IUCs were doing and would be more of a hurdle than an asset. By having a scientist in the field as Chairman, the IUC stood to gain further support for its decision in the eyes of the UGC. We went along with this decision.

As events were to show a few years later, this was a wise decision.

## HEADING FOR RETIREMENT

I had taken charge as paid full-time Director of IUCAA in 1989 and had received renewal of my term for five years in 1994. During my two tenures I had cordial relations with all UGC Chairmen who had held office during 1989-99. Yash Pal, who had provided the starting impetus was succeeded by Manmohan Singh, who left after a brief period at the helm of the UGC to take up the responsibilities as a reforming Finance Minister. He was succeeded by Ram Reddy who had been present at the dedication of IUCAA in 1992. He left in 1994 to be followed by Armita Desai. It was during her tenure that I was approaching the end of my second term as Director.

Since taking up the responsibility of setting up IUCAA and running it as Director, I had been conscious that my main interests of research and science popularization should not suffer while I was stewarding IUCAA. As was inevitable, the starting years 1988-93 did take up considerable part of my efforts and time, but even then I was carrying on with my research. In 1989 five of us, Fred Hoyle, Geoffrey Burbidge, Halton (Chip) Arp, Chandra Wickramasinghe and I met in the University at Cardiff to have a brainstorming session on cosmology.

Already in 1989, we felt that cosmology was heading into highly speculative directions in order to subscribe to the big bang dogma. The speculative nature of the field had increased with the growing collaboration between cosmologists and particle physicists since 1980. Astronomy and cosmology have certainly gained in the past from inputs from microscopic

physics. Atomic and nuclear physics have provided the lifeline to the astrophysics of stars for example. Electromagnetic theory has always been a source of strength to the subject. However, in such cases, the astrophysicists were seeking explanations of observed features of the universe, like stars and galaxies. And, the explanations invoked laws of physics that had been well tested in the laboratory.

The situation with regard to cosmology was based on extrapolations of the physical laws to unknown frontiers to energies far higher than those at which the laws had been tested in the laboratory. For example, the laws have been tested at particle energies as high as 1000 GeV. For a comparison, the energy that a proton has when moving slowly is around 1 GeV. High energy particle accelerators make these particles move at such speeds that their energy grows a thousandfold. The biggest such machines are at CERN, Geneva and Fermilab near Chicago. The cosmologists investigating the state of the universe close to the big bang, however, wanted to know how particles of matter would behave at energies ten trillion times this energy. Moreover, there were no observations that directly relate to us what the universe was like at those times.

This last statement is a consequence of the big bang model itself which tells us that as we look farther into the universe we see it at earlier and earlier epochs. Because, light from these distant sources takes time to travel to us. However, if we push our observing capacity farther and farther, we encounter a situation that light from these distant sources begins to get scattered by the electrons present at high density. Thus there is a limit beyond which a curtain descends between us and the very early epochs of the universe: a curtain thick enough to make them obscure.

In short, astronomers are keen to know what and how about the universe that they cannot not see with the help of a physics that has no tested theory for it.

In our discussions at Cardiff we had not only felt the need for changing the direction of cosmological research to less speculative areas, but also direct them to puzzling observations that have been around crying to be explained. Chip Arp, a very distinguished astronomer with several important observations to his credit, including an atlas of galaxies with peculiar unexplained features, had already a collection of hosts of such phenomena that defied the standard expanding universe type explanation. It was thus necessary for cosmologists to channel at least part of their energy towards understanding these phenomena.

As the result of our deliberations we talked to John Maddox, the Editor of the prestigious science periodical *Nature*, on our ideas and he suggested our

writing a review article based on them for publication in the journal. Our article did eventually surface in *Nature* about a year later. Its publication was violently opposed by some referees while others felt that our views, even though they were ‘anti-establishment’ needed to be aired. As a result of our article, the ‘Establishment’ also got a rejoinder published in the same journal, by Jim Peebles, David Schramm, Michael Turner and Richard Kron. This appeared a year later.

The establishment of big bang cosmologists took the view that, even if highly speculative, their approach provides a reasonably comprehensive explanation of the universe. They do not take note of the anomalous observations that Arp and a few others find, thinking that they would ‘go away’ after a few years if one used better observing techniques. And more importantly, they argued that there is no other credible theoretical framework to describe the universe.

On the last count, we have on hand a chicken-and-egg problem! Since the establishment has the view that the big bang picture is right, it would be very hard for young research workers to engage in work that opposes that doctrine. Any scientist wishing to pursue research on alternative models will have tremendous difficulty raising funds from scientific agencies, since peers reviewing the proposal would mostly have the establishment view. So, naturally there has not been significant advance in alternative models of the universe.

We felt therefore that time was ripe for proposing an alternative model. Fred Hoyle and I Geoffrey Burbidge (HBN together) met in Cambridge in succeeding years and by 1993 we had arrived at what is called the *Quasi-Steady State Cosmology* (QSSC in brief). This model described a variant of the steady state model proposed by Bondi, Gold and Hoyle in 1948, on which I had worked as a research student of Hoyle.

This is not the place to describe the QSSC in detail. The accounts of this model have appeared in several places. For a technical account the reader may see our (HBN) book entitled *A Different Approach to Cosmology* published by the Cambridge University Press. A nontechnical account may be seen in a book by myself and the late Geoffrey Burbidge. The book is titled *Facts and Speculations in Cosmology* and is published by the same publisher. It is sufficient to say that the universe, according to the QSSC *never* had a beginning at some epoch: it has been in existence at all epochs, with phases of expansion and contraction superposed on a long term steady expansion. This behaviour is driven by the creation of matter which takes place in finite amounts through small explosions called ‘minibangs’ or, ‘minicreation events’. The physical law

relating to this modest creation of matter is related to the same scalar field (the C-field) that was first introduced to describe the steady state theory.

Our interaction continued even when we did not meet. The fax and e-mails across different time zones played a vital role in this interaction. One example was that at the end of the day (say at 4.30 p.m.) at the Royal Greenwich Observatory which had shifted to Cambridge, we would fax part of our manuscript to Geoff's secretary in San Diego. Being eight hours behind, the office staff there would just have reported for work. So our manuscript would be typed and faxed back by 4 p.m. San Diego time, arriving in Cambridge by midnight. Thus we would have the typescript ready at 9 a.m. when our working day started. This way of working would not have been possible with a local typist.

I recall that in 1994, in an editorial in *Nature*, John Maddox had drawn attention to the extensive work done by the three of us on the QSSC. He had commented that we were veterans working almost in isolation, on a new idea that deserved to be looked at by the community. The 'community' was and has been less than responsive. Our book mentioned above, attracted good reviews and is selling well. However, to the extent of generating a live debate on several basic cosmological issues, we have not succeeded. But, this has not deterred us and we hope that one day a more objective approach to cosmology will once again take root.

Despite the lukewarm response to the QSSC, there has been a wide appreciation that at least some sceptics are still around to question what many believe to be a dogma, the so-called 'big bang dogma'. I was considerably pleased at the honour I received by being appointed President of the Cosmology Commission of the International Astronomical Union for the three years 1994-97. I sometimes feel that by following the establishment line I might have moved farther in my career in the matters of awards and recognition; however, rightly or wrongly I have preferred to play the role of the proverbial 'devil's advocate'. My senior colleagues Fred Hoyle and Geoffrey Burbidge had elected to do the same. Fred Hoyle used to justify his standpoint by these words: "There are so many bright brains working on the establishment picture that if it were correct, they should by now have got some remarkable result in confirmation of their ideas. The fact that they have not, makes me believe that the answer lies elsewhere and so I feel tempted to try out uncharted territory."

In 1991, I had made a trip of the United States under the Indo-US exchange programme supported by NSF and CSIR. I visited several centres, including the University of California at San Diego, the California Institute of

Technology and the University of Syracuse. I also had informal talks with other astrophysicists like Geoff Burbidge at UCSD, Willy Fowler and Kip Thorne (Caltech), Bob Wagoner (Stanford), John Faulkner (Santa Cruz), Kochu Menon (University of British Columbia), Dick Bond (Canadian Institute of Theoretical Astrophysics), Kamesh Wali (Syracuse), etc.

Mangala had accompanied me and we had planned a rather unusual trip across North America. We landed at San Diego and after spending two weeks at the UCSD, we rented a car and drove all the way along the West coast to Seattle keeping as close to the coast as possible. We surrendered the car at the Seattle airport and took a flight to Vancouver. The Seattle stop will always bring back to my mind the shocking news we heard there: Rajiv Gandhi was assassinated in a suicidal bombing incident while on an election tour of Tamil Nadu.

Our trip continued from Vancouver onwards, but this time on the long distance train. We spent 2-3 days with Kochu and Rama Menon at Vancouver, where I gave a talk on cosmology at the Physics and Astronomy Department of UBC. I had been talking on cosmology in the United States also; but here I was in for a pleasant surprise. I was delighted to find Maurice Pryce, whose 1960-work I had been using extensively. For a while he had been guiding my Cambridge Guru Fred Hoyle when he was a research student.

The train journey from Vancouver to Toronto was memorable in many ways. I am a lover of train travel and for me this was fulfillment of a childhood dream. In late 1940's, I and my brother used to look at the ads of *Canadian Pacific Railway* in the issues of the National Geographic magazine and aspired to travel in the train some day and look out from the observation car with vista-dome. This was now possible. The three days and four nights journey in *Via Rail* also gave us excellent views of the Rockies, the Prairies and the Lake District. The journey was a leisurely one and allowed us plenty of rest after the somewhat whirlwind journey till then.

At Toronto I gave a seminar to the scientists at CITA and after spending a couple of days there we flew into the USA to Syracuse. This was in a small 18-seater plane of one of these feeder flights. We were the only passengers who were not from the USA or Canada and so the immigration was not a long drawn out affair as at JFK or other major airports of the United States. In fact, in a charming gesture, the customs Officers helped us carry our bags to the exit point. Here Kamesh Wali was waiting for us. He, like me was a B.H.U. product of an older vintage. He and his wife Kashi have always been good hosts. From Syracuse we flew to New York and then flew out to India from there.

This was our last trip to the USA when our daughters were still in India. In 1992 our eldest, Geeta went to Stanford to do a Ph.D. in biochemistry while in 1993 the next one, Girija went to Carnegie Mellon to do Ph.D. in computer science. In 1994 when we were in the USA, we had taken our youngest daughter Leelavati with us. At the time she was in school in Pune. Wishing to see our daughters in their new 'residences', we found excuses to fly round the USA and Canada in later years.

My subsequent trips to the USA during the last century were in 1996, 1999, 2000. The 1996 trip was to attend a conference in honour of Bill Tifft who was another of those observers who keeps finding anomalous results that get ignored by the majority of cosmologists. In 1999 Mangala and I were invited to attend as chief guests the 'Brihan-Maharashtra Sammelan' at San Jose. I had to address some 5000 expatriate Marathi speaking persons and their families, mostly from North America. Leelavati had also come with us and we had gone with Geeta and Alok to see the Yellowstone National Park. On the way we also saw the famous Mt Rushmore national monument. The weather at Yellowstone turned icy and wet (even in June) and for a brief period I was wondering whether our plan to do camping was a wise one. Eventually I did enjoy the experience. Apart from our daughters, my cousins (daughters of my uncle Vasantmama) Snehal and Aparna who, like their father, were professors of statistics were sources of attraction to the USA.

In 2000, I attended the IAU General Assembly in Manchester. Since 1988, I had been attending the IAU general assemblies and had been to the one in Buenos Aires in 1991, to the Hague in 1994 and to Tokyo in 1997. Since 2000, however, my main interest in the IAU has been because of its efforts in astronomy education and dissemination.

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In every family there are happy as well as sorrowful events. For me the passing away of my father in 1991 had brought a great sense of personal loss. He had been one of the guiding lights for me. After his departure, my mother (Tai) naturally felt very lonely. While my father was around most of her daily routine was centred on him, as she would look after his every need. My father used to say that Tai had always pampered him. One of the common activities that they engaged in was the regular reading of *Bhagavatapurana* (a Hindu mythological scripture containing many stories as well as wise comments).

Apart from reading together, they used to go for walks. When we lived in

the TIFR housing colony, several of my neighbours used to say that they could set their watches by observing when my parents come out for their walks to the seaside. As has been mentioned earlier, Tai had developed a liking for the musical instrument *Esraj*, into playing which she had been inducted by the great musician Vamanrao Padhye. She had her regular sessions of playing esraj, when she would not be disturbed. She also had her own reading to do. Indeed, especially in retirement my parents had found reading a very absorbing pursuit.

After my father's death, to fill the gap in her life, I suggested to Tai that she wrote down reminiscences of their days together. This seemed to work well as she took to the effort in all seriousness and began writing sheets and sheets of paper. My marathi publisher Madhukaka Kulkarni of Shreevidya Prakashan evinced interest in reading them and afterwards suggested that they could be compiled into a book of biographical memoirs. Tai agreed and she put it in a book form which eventually appeared with the title *Kahani eka wranglerchi* (The story of a wrangler).

But I think the blow of my father's death had been a more serious one than could be softened by these diversions. Tai's health began to fail gradually and eventually she was bedridden. As her bodily organs began to fail she had to be more and more dependent on others. For one who had been the main support for my father and had led a very active life both physically and intellectually, this was a sad experience. We had to get professional ayahs to minister to her round the clock. Mangala also had been put to great stress in ensuring that Tai was looked after well.

On April 15, 1997, Tai quietly passed away in sleep while having her afternoon nap. In a way it was a relief to her tortured body. These are the cases where one feels that death is the kinder option. Several of our friends and relations from IUCAA and outside came to pay their last homage to her. As with my father, no religious rites were performed for her cremation and we immersed her ashes in the Indrayani river.

For me the departure of both the parents brought about a new realization that now there was no 'senior' close to me to guide or comfort in moments of crisis: I was on my own in that respect. Such a feeling suddenly brings about ageing. Not that in recent years I had been consulting my parents often; simply the feeling that they were there made all the difference.

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During my tenure at IUCAA, there were moments to celebrate too. In

September 1996, we celebrated the engagements of Geeta and Girija. Both were at IIT, Mumbai and had found their fiances there, although they took their final decisions regarding getting affianced only while all four of them were studying in the USA. Geeta's fiance, Alok Srivastava was from Mumbai, although, by a happy coincidence, his father had been at the B.H.U. as a student around the same time as I. Girija's fiance was Rahul Parulekar also from Mumbai. These developments took a great load off our minds as both Mangala and I were beginning to think about how to broach the subject to our daughters. Ours had been an arranged marriage, although there was an element of 'freedom of choice' on both sides. Still some three decades later, the customs had changed somewhat with the younger generation wanting full self-determination. So we were very happy when they conveyed their respective decisions to us.

All of us parents felt that we should have the engagement ceremony, preferably a joint one for the two couples in Pune. We had the benefit of the Director's spacious bungalow and in deference to our daughters' wishes we wanted to have a short and informal ceremony inhouse. They preferred the ceremony as laid out by the Jnana Prabodhini, a social organization which runs the school where Leelavati had been a student. This ceremony was a short one and allowed improvisations that suited modern thinking. For instance, it treated the bride-to-be as an individual and not as an object to be 'given away' to the groom. After the 50-minute ceremony we had a lunch under a marquee to which close relatives and acquaintances were invited.

However, Mangala and I wanted to involve the IUCAA family too. So in the afternoon we had organized a music recital with rising young stars from Pune, to which we invited all IUCAA staff and families. They were later treated to dinner at IUCAA. Both the music and dinner were memorable occasions according to the 300-odd invitees. One lasting point of satisfaction for Mangala and me was that on this occasion the couples could receive the blessings of my mother. Tai was at the time well enough to watch a part of the ceremony sitting up.

Both Geeta and Girija had decided to get married only after they had completed their Ph.D. formalities. Accordingly, Geeta and Alok got married on December 26, 1997 and Girija and Rahul on July 20, 1999. Both these ceremonies were performed in the Director's residence following the Jnana Prabodhini pattern. We had printed all the steps in the ceremony on a leaflet and distributed it to the audience so that they could understand and participate in all the rituals. The rituals, again were very few and were relevant to the

well-being of the wedding couple. I was very happy that all the guests appreciated the significance of the steps in the ceremony.

In 2002, our youngest daughter Leelavati also left for the USA for higher studies. She had gone to Cummins College of Engineering in Pune where she had done her B.E. in computer science. She was now leaving for her Ph.D. in that subject at Duke University, North Carolina. Like Geeta and Girija 10 and 9 years before, Leelavati also managed to get a fellowship to support her education in the USA and so we did not have to spend any money on her overseas education. She was to leave in August for the USA and by a happy coincidence, Girija had informed us that she was expecting a baby in late August. So taking both these items together, Mangala and I had planned to reach the USA on August 8, along with Leelavati. Thus we would be there to welcome our first grandchild and also make sure that Leelavati was well settled in her new university.

However, on the first of these items we were anticipated! Mallika Kumud, Girija's daughter decided to arrive in this world ahead of time, on August 6. Despite the unexpected, Girija and Rahul managed the early days very well, but were glad of our arrival, albeit two days later, for support. Geeta, who was in Boston, said that she would fly into the Raleigh-Durham Airport to rendezvous with Leelavati so that she would help her settle. She argued that with a generation gap, she would be better equipped than I in anticipating the needs of a fresh student! Mangala and I spent about eight weeks with Girija, Rahul and Mallika, during which time we managed to make a short trip to see how Leelavati was getting on at Duke.

Apart from the family events, there were occasions when I received special award or recognition for my research or for my science popularization efforts. The Vainu Bappu award and the Indira Gandhi award both conferred on me by the Indian National Science Academy recognized these two aspects of my work. The two Birla awards, one (B.M. Birla) from Calcutta, for contributions to astronomy and astrophysics, and the other (G.D. Birla) from the Indian Physics Association for my contributions to physics, the Pylee award from Cochin, for academic contributions, etc., were indicators of the impact my modest efforts were having nationally. However, I felt greatly honoured when one afternoon in 1996 Ms Padgaonkar from the UNESCO office in Delhi telephoned to say that I had been selected, along with Jiri Grygar of the Czech Republic, for that year's Kalinga award.

The Kalinga Award was instituted in UNESCO by the Kalinga Foundation Trust in India started by Biju Patnaik. The award recognizes science

popularization efforts and had such early recipients as Bertrand Russell and Margaret Mead. My mentor Fred Hoyle had received the award in 1968. For me therefore it brought special happiness. The ceremony was in Delhi, although both Jiri and I were also taken to Bhubaneswar, Patnaik's home town and headquarters of the Kalinga Foundation.

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A highlight of my time at IUCAA was the visit by Fred Hoyle in 1994. Hoyle had been my mentor in research. I had also been inspired by his forays into science fiction and his successes in general as science popularizer. But there was another aspect of him that I had drawn upon. In the 1960s he had founded the Institute of Thaoretical Astronomy (IOTA) which has since flourished with a revised incarnation of IOA (T dropped!) as a world class institution in Cambridge. I was very keen therefore that he saw IUCAA.

As mentioned earlier, in 1987, December, when he had come for the International Conference on Gravitation and Cosmology at Goa, Naresh and I had brought him to Pune also. At the time he saw the GMRT project that was just beginning but we had nothing of our own to show him. Looking at the wealth of banyan trees on the campus, he advised: "As and when you build, do preserve the trees." This advice we had followed by transplanting those trees that were threatened by the building project.

Now, six years later in February 1994, we welcomed him to a fully developed campus. I would have loved to welcome Barbara also. Unfortunately, she had been indisposed. She had all along looked after Fred and felt comfortable when their daughter Elizabeth (Liz) could take time off to accompany him. Fred was impressed by IUCAA's architecture and gave us a pat on the back for our academic progress. By a happy coincidence, Geoffrey Burbidge was also visiting us and so the two old friends were with us at the same time.

Fred gave a seminar on cosmology at IUCAA and also gave two other lectures. His public lecture on how the arrival of a comet had coincided with major changes in human history was, as usual, unusual and thought provoking. But I found even more intriguing his talk to schoolchildren on the second Saturday. He used a simple algorithm of multiplying complex numbers to generate shapes on the plane of complex numbers that resembled leaves of well-known trees!

At the time Fred was in his 79<sup>th</sup> year and still very active both intellectually

and physically. I would have liked him to visit again, but alas, that did not materialize.

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In case my account of IUCAA has given the impression that it was a cake walk, it is necessary to correct that impression. An account of my final years at IUCAA will not be complete unless I describe the period when all of us had to pass through a very anxious phase.

My second term of directorship at IUCAA was to end on May 31, 1999 and well in advance I wrote to the Chairperson, UGC (Dr Armity Desai) to look for my successor, since I wished the baton passed to someone younger. I also accepted the offer of a Homi Bhabha Distinguished Professorship from the Department of Atomic Energy, which the Chairperson, UGC, permitted me to hold after my retirement. After my retirement as Director, I was planning to stay on the campus as Homi Bhabha Professor.

As part of the operation to appoint a director, the Chairperson formed a Search Committee (SC) consisting of Professor Bambah, who was the Chairman of IUCAA's Governing Board, Professor Yash Pal, and Professor Arun Nigavekar who was the Vice-Chancellor of Pune University. The SC visited IUCAA and spent time with me, my colleagues and the administrative staff, to form an opinion as to whom they wanted to be the next Director. The entire process was open and transparent, unlike the case in TIFR. After their deliberations, they came to the conclusion that I should be asked to continue as director for a third term, until I reach the age of 65. Two seniors in our field, Professors Vaidya and Raychaudhury, who were also IUCAA's honorary fellows had already made a special visit to IUCAA to persuade me to continue. The Chairperson, UGC also put in her own weight behind such requests with the result that I agreed to remain as Director till July 18, 2003, the day before I turned 65. I retained my Homi Bhabha Chair in an honorary capacity.

However, what I had believed to be a continuing gentle ride to my retirement, was destined to have some nasty bumps. The events leading to them began with the retirement of Armity Desai in April, 1999. By that time the successor to her position had not been appointed and search for a suitable person started. In the absence of the Chairman, the Vice-Chairman, was given temporary charge. I had met him a couple of times and found him very gentle and polite. In this account we will refer to him as Y.

In the meantime, we were processing an important administrative matter

at IUCAA. Looking at the national profile of IUCAA, and its growing span of work, the Governing Board had felt that the head of the administration should be upgraded to the level of a university registrar. This decision was conveyed to the UGC who deliberated the issue and eventually conveyed its concurrence. The Secretary, UGC, Dr Sharma forwarded guidelines to be followed in advertising the post and making selection. We followed all the steps as indicated. The post was entitled "Chief Administrative Officer".

Thus we had advertised the post and were receiving applications, which also included that of Tarunaditya Sahay who was the Senior Administrative Officer at IUCAA. At that time Y happened to visit Pune University. As a courtesy I also invited him to visit IUCAA, which he did. He was very impressed by what he saw in his brief visit and said so. However, he then pulled me aside and asked whether we had been getting applications for the CAO's post and upon my replying in the positive, added that he knew one applicant who was very good and who, he felt, should be appointed.

I was somewhat taken aback by this direct approach. I had been hearing of VIPs putting pressure on selection committees for posts of various levels, although I had never myself encountered such pressures. In this case I gave the reply that the decision rested with the selection committee and that I could only ensure that the candidate in question would be called for interview, assuming that he fulfilled the stipulated conditions. The matter rested there...so I thought.

The selection committee, which had directors of other institutions also, duly met and interviewed the candidates in detail. After careful deliberations, the committee shortlisted them with Sahay as number one and the candidate recommended by Y as number two. The decision was communicated to the Secretary, UGC who checked on the details and then sent his concurrence. I then circulated it to the Governing Board members who also recorded their unanimous approval.

By then the Government of India had appointed Y as Chairman, UGC and he was firmly in saddle. While I was awaiting the GB's approval, I received a phone call from him. He enquired in his very polite way, as to what had been decided in the CAO selection. I was hesitant in answering him since the matter had been put up to the GB. The Chairman appreciated my reticence which he agreed was appropriate; but made a special request bound by undertaking of confidentiality, to know the answer. I then briefed him about the recommendations of the selection committee which were now with the GB. "Do you think, Mr Sahay will accept the post if offered as number one on the

list?" He asked. I replied that, I could not speak for Mr Sahay, but felt that as he had applied he would accept the offer if made. Whereupon, he thanked me and rang off. I thought that the matter ended there.

I was, however, in for a rude shock! In July I had scheduled the GB and Council meetings in the UGC office, in Delhi. By tradition and also by the rules of the Centre, the GB looks at the important administrative as well as other matters in detail, while the Council (the larger body of which GB is part) surveys the broad canvas and lays down general policy guidelines. In his capacity as President of the Council, the Chairman, UGC introduced a topic that did not belong to the agenda and should have properly been dealt with by the GB. He said that having examined the history of the CAO's post at IUCAA, he had come to the conclusion that the UGC was not authorized to create such a post and as such the appointment made to it was not valid! In this argument, he was supported by the Finance Advisor. In fact as we were to discover soon, henceforth, the major decisions at the UGC were to be taken by this duo, bypassing the Vice-Chairman and the Secretary of the UGC.

Anyway, at the time all GB and Council members were taken aback and several expressed the view that the UGC was in fact empowered under the Act of Parliament to create inter-university centres and to frame rules of their functioning, including creating posts. The UGC itself may need approvals from the relevant government authorities for its own posts. Nevertheless, the proper thing would have been to have let the earlier decision taken by the UGC Chairperson stand and to examine the issue for future purpose. But Y would not stand for it and said that he was going to refer the matter to the HRD Ministry. This he did despite advice from his own administrative staff dealing with the IUCs. (In fact at one stage one staff member informed me that he had dissuaded the Chairman from appealing to the Government of India; but later the FA prevailed in prompting him to go ahead with it.) The way the reference to the Ministry was worded was such that their normal response would be to conclude that the creation of post was not within the jurisdiction of the UGC.

Another matter that came up at that meeting related to the library stock-taking. As a routine, the annual stock-taking had revealed a few missing books. The amount was well within the 'write-off' limit, since every year some books are inevitably missing, despite stringent security measures. However, Y opined that this was a serious matter and that IUCAA should institute an enquiry with outside experts. Several Council Members from other institutions said that such losses are routine and do not call for an enquiry. But Y refused to

budge. Eventually we did have an enquiry with librarians from outside which ended in confirming that such losses are to be written off.

As we left the UGC building for the India International Centre, both Professor Bambah and I were in introspective mood. We had realized that under the new regime one needed to be very vigilant to preserve the Centre's autonomy. The matter of CAO's appointment was bound to lead to several problems. I felt that the reference to the Government of India would only result in a negative response and that it was tactically a wrong step to have undertaken. Firstly, by referring the propriety of its own action, the UGC was surrendering its autonomy. Secondly, by going back on the decision taken by his predecessor, Y was sending wrong signals: that there was no longer any sanctity attached to the earlier decisions. Later events fully justified this apprehension. For IUCAA, the problem would arise if the GOI responded negatively and invalidated the appointment. In this case we would have to offer him his old post that he had resigned before accepting the CAO's post. What would have happened if the person chosen for the post had been from outside? Having resigned his position in another institution, where would he have gone? Somehow, I could not avoid the conclusion that this situation would not have arisen if we had appointed the nominee of Y.

Nevertheless, here was the situation where the change of statutes had brought for us a chairman of the GB who was different from the UGC Chairman. Under the old byelaws I would have to deal with Y as Chairman of the GB. For me, with Professor Bambah as the Chairman, I had the comfort of a senior wise man whose advice would be immensely useful in the hard times ahead.

In 2000, I had gone to visit Professor Katsuhiko Sato's group on a two-month Millennium Fellowship programme. I was to be there in the months of February and March. Soon after I went there, I received a communication from Padmanabhan (Paddy), who was acting as Director while I was abroad. It said that the UGC had received a negative reply from the HRD Ministry cancelling the CAO's post allotted to IUCAA and asking the Centre to revert Sahay to the SAO position. Following the counsel of Professor Bambah, I asked Paddy to inform the UGC that the Director was abroad and will take suitable action on his return.

In March, I received information from my colleagues as well as from news on website that the UGC had introduced astrology as a new discipline to be taught in the science faculties of universities and that posts of professor, reader and lecturer would be available to those universities wishing to teach

astrology. The authorship of this proposal could be traced to Y who was a staunch believer in astrology. I realized that here was another front on which I would have to face him on the opposite side.

The Japan trip went off well academically and I was able to visit Fukui and Kyoto besides Tokyo and lecture on my work. Mangala joined me for the last two weeks and we were fortunate that 'Sakura' (cherry blossom) arrived just a few days before we were due to leave. In 1971 we had seen the cherry blossoms in Washington DC, the trees there being gifted by Japan to the United States. It was a special pleasure to see the blossoms in the country best known for them.

Back home, I took the initiative in drafting an appeal to Y asking him to withdraw this new front on astrology as it was not a science but a superstition. The appeal was signed by many of my colleagues at IUCAA and sent to him. After ensuring that it reached his desk, I released the text of the letter to the press. When the press approached him on this subject, Y denied receiving the letter, although it was sitting on his desk!

Meanwhile, the assault from the FA was continuing. After drawing first blood on the CAO issue, he asked for the origin of the post of 'Distinguished Scientist' at IUCAA. This post had been created right in early days with full approval of the UGC to recognize special achievement in academic field. A post like this exists in major scientific research institutes. When the V Pay Commission met and refixed the salaries for various posts, we had a joint meeting of all IUCs with the officials of the HRD Ministry and the pay-scales of various posts including that of the Distinguished Scientist were fixed. Subsequently IUCAA appointed Professor Shyam Tandon to this post. Although this history was given, I received a letter from Y asking me to cancel this post as the UGC was not entitled to create it and to revert Professor Tandon to his earlier scale. At this stage both Professor Bambah and I along with the GB decided to play a waiting game by engaging in correspondence with Y to argue against this ruling. We were looking forward to April, 2002, when Y was due to retire.

Our holding action, however, finally had to come to an end so far as the CAO episode was concerned when our appeal to the HRD Ministry through the UGC was not accepted. So with great regrets, I called Sahay to explain to him our difficulty and offering him his lower post but with the salary refixed in the SAO-scale such that he did not lose but gained a little. This was the best I could do on behalf of the GB. Sahay thanked me for all the battles I had been fighting on his behalf but decided to take recourse to legal action. Only by

appealing to court of law could he now seek redressal of the injustice done to him.

Sahay moved the Mumbai High Court and made IUCAA, UGC and the HRD Ministry as respondents. We were asked to file our replies to it. IUCAA's reply consisted of the sequence of events and actions relating to the case. The reply filed by the UGC, however, took liberties with facts. It stated that the CAO's appointment was made by IUCAA without consent of the GB. This was manifestly untrue. In fact we were told that the UGC official dealing with the IUCs was asked to sign such an affidavit and he refused to do so on the grounds that it was untrue. Whereupon, he was served with a memo and another official who was not familiar with the case was asked to sign it. Given this affidavit, IUCAA was forced to file another one, rebutting the UGC version.

Sahay's case was admitted by the Mumbai High Court, but because of an inept lawyer, he did not ask for interim relief to which he would have been entitled. Still, I felt somewhat comforted when he applied for and got the Registrar's post at the celebrated TIFR where he was happily employed. Later he was appointed at higher posts in other institutions.

There was another issue on which, however, we were anxious to move fast. For, at the instance of the FA, Y had referred the promotion policies for academic and scientific staff of all three IUCs, to a committee of government bureaucrats for their approval. There was in fact no need for this since the policy had been in operation for a decade or more and there had been no objections raised by any government bureaucrat to the way it operated. However, given the reference, the committee met several times. In the meantime the IUCs were asked to keep all promotions on hold and this had created a feeling of frustration not only amongst those who were due for promotion but also of the seniors including myself who were to process the promotions.

Since no information was coming out of the UGC on when the issue would be resolved, I approached Arun Shauri who was a cabinet minister with the request to check on the progress of the government deliberations. He kept following the matter and keeping me informed. One day he sent word that the committee had approved the promotion policies prevailing in the centres and that they could continue with them. He informed that the UGC Chairman had been briefed on this decision.

I was expecting all the concerned IUCs to be informed within, say, a month. However, several months passed and no letter came. The NSC director also kept knocking at the doors of the UGC to be told that they were seeking a certain clarification from the HRD ministry, before informing the IUCs.

The HRD officials, however, kept iterating that the directive given to the UGC was quite clear and needed no further clarification. Internal enquiries at the UGC secretariat confirmed for us that the matter was being held up by the duo, Y and the FA.

Finally after more than six months, the UGC informed us that we may continue with our existing promotion policies. However, they added a rider (not in the original government directive) that effectively meant that scientists whose promotions were held up because of this delay would not get any benefit for it. This, I felt was manifestly unjust.

All through such harassment, I tried to keep my cool, although there were occasions when I felt like resigning in protest. It was the calming influence of Professor Bambah that held me in check. There was some light at the end of the tunnel when Arun Nigavekar was appointed Vice-Chairman of UGC. We felt that with him there some sanity will come back to the system. However, we still had to wait, for Y did not wish to share any decision making with the Vice-Chairman. It was on April 4, 2002 when Y retired and handed charge to the Vice-Chairman that we breathed a sigh of relief.

With Nigavekar at the helm as the new Chairman, matters reverted to the normal smooth functioning, more so as the FA, his term over, was gently but firmly eased out. As it was now barely a year before I retired, I requested the new Chairman to take steps to find my successor. Additionally, he also needed to find a successor to Professor Bambah, whose second term as Chairman, GB was also coming to an end just a month before I retired. He initiated a search committee which finally did its work well in time. About four months before I retired, the name of my successor was announced. Appropriately, it was Naresh Dadhich an old hand at IUCAA. At the same time, as guided by another search committee, Professor Bambah's successor was also announced: again a very good choice: of Professor Mukunda, who had been part of the small committee constituted by Yash Pal to set some goal posts for IUCAA in the early days.

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On July 19, 1999 I turned sixty and several of my colleagues arranged to have a small get together in my honour. In a very kind gesture, they brought together several close friends and well-wishers, including the publishers of my Marathi books. This was a surprise for Mangala and me as we were simply told to come to IUCAA's recreation Centre for lunch, when called. There were several short

speeches with kind remarks about me. All members of IUCAA were also present and it was like one big family enjoying itself.

About six months later, an academic meeting was organized also to celebrate my turning sixty. On this occasion there were several of my friends and coworkers from all over India and also from abroad. There were technical papers presented in A & A and these were subsequently printed in a volume published by Kluwer Academic Publishers. It contained articles also by those, like Fred Hoyle, who could not be present at the meeting.

As my retirement year appeared to draw close, again there was a request from two sources to organize meetings to mark the occasion. From IUCAA, Ajit Kembhavi and Naresh Dadhich wanted to go ahead with an academic (research oriented) meeting while my friend Anantrao Deshpande, Secretary of the National Council of Science Communicators wanted to arrange a meet of science popularisers. In the end, both events went ahead and I was told not to worry about any organizational details. These events took place, in the last ten days of June and in early July, 2003. The science populariser's meet took place in the premises of the Bhabha Atomic Research Centre followed by the academic meeting, of course, in the premises of IUCAA. Both occasions were memorable for me. In the Mumbai meeting I was felicitated at the hands of Yash Pal, whereas at IUCAA, it was Nigavekar, Chairman, UGC who did the honours. Again a number of persons came from various parts of the country and from abroad who made short speeches of good wishes.

Side by side we were taking steps to make a move from the Director's residence to our own private apartment. We had a flat in the Khagol Cooperative Housing Society in Pune, in the Panchavati area, not far from the campus of the National Chemical Laboratory near Pashan. This society had been floated in the 1990s, by scientists at IUCAA, NCRA and Pune University, and some 20 of them had been part of this society. I was hoping that our flat would be constructed and handed over well in time before I retired. In the event, as happens with most building projects in India, we managed this just in time!

Although I was due to retire on July 18, I had to be in Australia earlier for the General Assembly of the International Astronomical Union. So I was to hand over charge to Naresh on July 4 in the morning, leaving for Australia in the afternoon. Mangala and I had accordingly managed to transfer all our furniture and other belongings, including a large number of books, to our flat and in the final days, we were having only the IUCAA furniture in the director's residence. The job of accommodating everything we had into a flat of only one third area compared to the director's house was clearly impossible. We also

realized that we had accumulated a lot of stuff over the years that we did not really need. So we had to give away a lot during the transfer operation.

We had earlier planned to get the transfer done in a smooth way so that things would be kept in their rightful places in our apartment. For this the apartment needed some work done on it, including built-in furniture, inside painting, etc. These things took longer than we had anticipated with the result that we barely had the time to move our furniture and other belongings into the flat by early July. We therefore decided to leave the stuff in packages and do the job of placing it in the right way after our return from abroad. We were to spend about three months in Australia and New Zealand, followed by a year in France. I was to spend a year in college de France, Paris, as an occupant of its Chaire International. In between we were to spend ten days as guests at IUCAA. At the time we were hoping to arrange our new flat in this brief interval. In the end we did so only in 2004, after our return from France.

However, that day on July 4, the only thought in my mind as I signed away Directorship to Naresh that I was finally leaving a task assigned to me by Yash back in early 1988 in a good state and in good hands. As I walked home for the last time from my office, I was sad and also relieved. I was no longer carrying a huge responsibility on my shoulders. I was finally able to say that all my time henceforth would be my own to be spent as I liked. This was beginning of 'Vanaprasthashrama' in the sense of old Indian tradition. As we said 'Good Bye' to Naresh and others gathered to see us off that afternoon, I had the feeling that it was farewell to a life we had known till then as we moved into uncharted territory.

## LOOKING BACK

**O**N my way towards winding up this long drawn tale of four cities, I now take a brief look backwards by way of introspection. Did I achieve most of what I wanted to? Could I have done differently by changing my priorities; and more importantly, *should* I have changed my priorities? Who were the principle players in the drama of my life guiding me through their example? Here are my thoughts as I write the final chapter.

When I visit a different place for my work or as a tourist, I go with an agenda of what I want to see in that place. Usually my visits have been with a relaxed itinerary rather than one requiring running from station A to station B. When I arrive there I get the feeling that I have plenty of time available to see what I wish to and so I take it easy. It is only when the time of departure approaches that I become anxious about fulfilling all the expectations that I landed with. Too late, I realize that the remaining time is not enough to complete my original agenda. So I have to be satisfied with what I managed to complete, leaving the rest for the next visit.

Life brings a somewhat similar experience. In my formative years I had several items on my agenda of achievement. As the lifespan was expected to be (hopefully!) long, I did not feel pressed for time. The lifespan, by actuarial standards did turn out to be long, but perhaps not enough to achieve all my goals. So towards the fag end of my active life I find myself like the tourist just described: but with the one important difference that here I do not have the chance of a second visit.

But honestly, reviewing my achievements, I find that I have not done badly, although I could have done better, but at a price. Most of the awards, honours and recognitions that I have won came my way without my soliciting them. I am also aware that I could have done better on this count, if my work had supported the doctrines favoured by the majority. At least four such areas come to my mind in this context. While quoting two of these examples below, I invite the lay reader to read the book *Facts and Speculations in Cosmology* by myself and (the late) Geoffrey Burbidge, published by Cambridge University Press.

For example, the majority view today is that the universe started in a big bang. If a poll were taken of astronomers and physicists, a large majority would vote for it. But how many can quote unambiguous evidence to support that hypothesis? Indeed, while this hypothesis quotes several observations in support, they in turn require further epicycles, that is unproven assumptions to sustain them. A second example is the belief that all quasars have redshifts indicating their distances to be large. This belief ignores evidence where such an apparently distant quasar shows evidence of interaction with a galaxy near us. Clearly for an interaction the two must be close neighbours. So there is a conflict with the standard rule for measuring distances known as Hubble's law.

In the supposedly level playing fields of science, it is expected that alternatives are examined and ruled out before the standard hypothesis is accepted. Instead, here one sees that the standard hypothesis is accepted first and any alternative is ruled out since the former cannot be challenged. A small minority (including me) believes that enough evidence exists to reexamine the situation. However, such a point of view does not get you anywhere these days. The most favoured point of view is to ignore such evidence in the expectation that they will 'fade away'. If a paper is written supporting the evidence, it is rejected by referees. Nor is any opportunity given to the worker to present it in a conference where it could be openly debated.

Despite such a hostile ambience, there are still some of us who prefer to work on such anomalous cases: for we believe that anomalies if real carry something new for science. Fred Hoyle, who led the small group of people like us, used to say that with so much brainpower spent on conventional work without producing any dramatic result, clearly that (conventional) approach must be wrong. Thus he justified the risk taken by those who stray away from the straight and narrow conventional route.

So such workers have to bear the lack of recognition, occasional ridicule and the experience of being passed over for awards. In some cases these do

come but belatedly as happened to Wegener who talked of the hypothesis of continental drift. Ridiculed during his life, his work was appreciated by the majority of experts in his field of geophysics only after his death.

Thus I have no qualms about playing the proverbial devil's advocate in my field at the price of missing out on some prestigious awards and recognitions.

\* \* \*

Since I mentioned Fred Hoyle as a person who influenced me, I would like to mention a few who likewise had a deep impact on my way of thinking. The reader may please condone any repetition of what I have said on earlier pages. In a chronological sequence I begin with my mother whom all of us called Tai.

Given that one picks up a lot from one's parents, What did I pick up from Tai? The need for self-organization! She was a well organized person, not only with regard to her own daily routine but also with regard to the household she had to manage. She took care that she would not be caught short in any arrangements for a visiting guest. Given the limitations of her budget, she would improvise. I have already referred to her inventiveness in my recollections of B.H.U. days. In Marathi, there is a saying describing a disorganized person as one who starts digging a well when thirsty. Tai would have three wells dug up and ready to use whether or not she was thirsty.

My happiest recollection of Tai in my childhood days is of story reading at bedtime. She covered a large menu of stories in English, Hindi and Marathi which she narrated in Marathi translated on the spot. She eventually led us towards the goal of self-reliance when we read for ourselves. The time and energy she spared for helping me and Anant to ensure that we lagged on no count in our studies was phenomenal when considering the plethora of duties that beckoned her from her household. She especially helped Anant during the year he got a double promotion. Indeed, the episode about Vyasmama described by me in an earlier chapter tells how both of us had come to depend on her.

Normally it is said that a boy grows up with his father's image as a hero. I was no exception, except that I continued to value the example set up by my father all through his life. An excellent teacher, he had left lasting impression on all those whom he taught. While travelling through India I came across his past students who adored him. The same applied to his research interest. He was one of the early workers in relativity and the students he created and inspired led to Banaras being recognized as an important research centre for

relativity. His image of sitting cross legged on a floor mat with sheets and sheets of calculation spread around is still fresh in my mind.

However, his one quality that has become rare today was his integrity. He would not budge from a just decision, no matter what the pressure or inducement. For this quality he was greatly valued by the Government of the state of Rajasthan where he was the Chairman of the Rajasthan Public Service Commission. A sensitive and influential post, the chairmanship can be grossly misused as has happened when in wrong hands. But in his time the RPSC acquired a clean image known for integrity and justice and above all, transparency.

\* \* \*

I now return to my interaction with Fred Hoyle. My interaction became closer as a result of the Ryle episode which I have described earlier, I will not go into details of our long research collaboration covering several fields which lasted till I left Cambridge in 1972, and continued intermittently even later. I will content myself with three highlights.

Much has been made of our work on the new theory of gravity based on Mach's Principle which we presented at the Royal Society in June 1964. This work give me great intellectual satisfaction as it provided a direct link between Einstein's general relativity and Mach's ideas on inertia. Einstein, who had been an admirer of Ernst Mach, had tried to find such a link but had not succeeded. For, Mach had argued that there should exist a long range effect which gives the property of inertia to any particle of matter. Thus a lump of matter has a mass and requires a force to change its state of rest or uniform motion (Newton's first law of motion) because it exists in a universe filled with matter. This idea of Mach had never been explicitly and quantitatively stated. Einstein had felt difficulty with it because it seemed to involve action at a distance, a concept which was introduced by Newton in his law of gravitation and had been used by Coulomb to describe electric and magnetic forces but which had fallen into disrepute by the beginning of this century.

I still recall the excitement both of us felt when after starting from the Mach end by defining inertia, our equations led us to a theory of gravity, to the so-called Einstein end! The gravitational equations turned out to be more general than those of Einstein's relativity, but we could see how the latter followed as a special case. This was the work we presented at the Royal Society.

This was not, however, an end in itself. We had further to go. During

1967-72 we were concerned with the quantum aspects of action at a distance and it was only very recently that we were able to show that the role of the large-scale structure of the universe can be very vital to our understanding of the microscopic quantum phenomena. I also suspect that our gravity theory may be able to throw light on some of the mysterious results on the redshifts of the quasars and galaxies—results that do not seem to fit into the framework of general relativity.

My second highlight was the hikes and trips both of us went on. Hoyle, or Fred as I came to address him, was fond of mountains and had made extensive trips in the Lake District and the Scottish mountains. I went with him on some occasions and have very rewarding memories of those trips. For, these were occasions when he would freely speculate on physics, astronomy on the one hand and sports, world affairs etcetera on the other. Often, the change of gears would be quite drastic! Camping, trekking, caravanning in the unpredictable weather of the region had their own excitement, like doing research in uncharted territory.

The third highlight of my Cambridge research career was the foundation of the Institute of Theoretical Astronomy (now Institute of Astronomy) at Cambridge by Fred Hoyle. In the early sixties, foreseeing the revival of astronomy, Hoyle had pressed for a new institute devoted to the subject to be created at Cambridge. For political reasons the claims of Cambridge with its long tradition of astronomy were ignored and a new centre was set up in the new university of Sussex. One reason given was that the centre would benefit by nearness to the Royal Greenwich Observatory (RGO) at Herstmonceux, Sussex. Hoyle was invited to head the centre but declined and continued his efforts to set up an institute at Cambridge. Since no government help was forthcoming he approached private foundations and thanks to the support of the Nuffield and Wolfson Foundations, he succeeded in setting up the Institute of Theoretical Astronomy in 1966. It brought a breath of fresh air into astronomical research in the U.K. and IOTA quickly acquired international reputation; so much so that when in the late 1980s, for reasons of economy, the RGO was required to make a shift from Herstmonceux to another part of the country, it opted for Cambridge so as to be next to Hoyle's institute!

In 1992 I had the honour of dedicating a bronze statue of Fred Hoyle to the institute on behalf of several donors, including numerous friends and admirers of Fred ... the dedication took place in Fred's presence. On that occasion I recalled that although Fred had refused to move to Sussex in the 1960s to be near the RGO, the RGO ultimately moved next to his institute;

thus Fred had been more successful than Mohammed had been in the tale of Mohammed and the mountain.

\* \* \*

My next inspirational source was Edward Morgan Forster, When I moved into King's as a new Fellow, my set of rooms were next door to Forster's, a fact which was no coincidence but arranged at his request. Forster himself was an Honorary Fellow of the college but, as an exceptional case he was living in. And, as we became neighbours, his first request to me was to address him by his name Morgan. At first it was awkward for me to address a person more than three times my age by his first name; but Morgan's informality soon put me at ease.

I have described several episodes involving Morgan and me. I feel I have gained a lot from Morgan's company: his humanist attitude, his observation of human nature, his gentleness that hid firm views and above all his cheerful demeanour in spite of the problems of old age. He suffered from occasional attacks that left him partially and temporarily paralysed. Once when he had recovered from such an attack he confessed to me: 'I am a little disappointed that I didn't have anything so grand as a stroke. The doctors tell me that it was just a fit.'

I should also mention that although I had heard several people in King's or in Cambridge speak of Morgan's homosexuality, I never experienced it or was a witness to it. He did once in a while refer to *Maurice*, his last and posthumously published novel, but that was always a fleeting reference. I do recall his being active in the literary opposition to the ban on the book *Lady Chatterley's Lover*.

As I wind up this random walk into the past I recall the tribute paid by a Fellow of King's who had observed Morgan over several decades: 'If I live a long life I would like to grow old like Morgan'. I cannot think of anything that would express my own feelings better.

\* \* \*

My last entry in this record of persons I learnt something from was Mangala's uncle, R.G. (Balasaheb) Rajwade. A well read man who had a keen sense of honour, RGR was an expert on industrial disputes. He had his own way of resolving a dispute that was transparent to both sides and more importantly, manifestly fair to both. Often he would eliminate the cause of a dispute so that the question of resolution did not arise. His language was cultured, approach

non-aggressive and reasoning free from any intimidating legal language. No wonder that he was in great demand from both sides of the industry, labour as well as management.

Seeing these demands, RGR who had a senior post in a Mumbai company, the second oldest British company after the dreaded East India Company, decided to take up Industrial Consultancy for labour disputes on a full time basis after retirement. He did set up a flourishing practice but unfortunately, early death by heart attack robbed him of several years of active life in this mode.

I learnt a lot from him that came in useful when I became Director of IUCAA. In particular, I came to appreciate the role of human ego in creating disputes. I had occasions to intervene between an academic member and one from administration or sometimes between two academics. I discovered that although scientists are supposedly rational, where matters of ego are concerned, rationality goes out of the window.

I can do no better than cite two episodes indicative of how RGR handled disputes. One arose when a labour leader came to his office to report that his workers are walking out. Why? Asked RGR. Because the company has shown disrespect for the national flag by hoisting it late. This looked a flimsy excuse and to set him right, RGR said: "Sir, I get your point but would like to seek a clarification. Since you care so much for our national tricolor, please tell me, which of the three colours is on top?" It is an unfortunate fact that many of our countrymen do not know the answer. The union leader belonged to that set and was visibly embarrassed at not knowing the answer. So RGR concluded: "Shouldn't you cultivate a respect for our flag by knowing what it looks like?" Needless to add that the walk-out did not happen.

The second episode relates to a dispute between Mangala and me! What was the colour of the sari Mangala was wearing? I called it 'blue' while Mangala insisted it was grey. As an independent authority we approached RGR who had actually bought that sari. He was put in a difficult situation. In a typical middleclass household the son in law carries great weight and is not usually contradicted. On the other hand RGR felt that Mangala's version was correct. So he replied, somewhat apologetically: "Well, I should say that till today I thought this colour was grey."

\* \* \*

Having acknowledged inspiration from various sources, I must express my gratitude to Mangala for her loyal support, coupled with advice whenever she felt that I had lost my way and needed to be ‘straightened up’. This, she did at the cost of opportunities that she might have had and those she well deserved. Like Fellowship at a Cambridge college or a job at TIFR. Instead, she gave more importance to bringing up a family, ensuring that her husband had access to all those opportunities that he wanted. In an era of social change, where the joint family was breaking apart in India and the pattern of family living such that husband’s parents did not automatically expect to stay with the family, she welcomed my parents in 1973 and looked after them to the end: that is eighteen years for my father and twenty four for my mother.

These things have the tendency of being taken for granted, which is not correct. Woman’s role in the family in India is undergoing a long due change for the better. Attitudes do not change fast enough and so the male’s feeling of superiority is still there. But economic conditions have now almost forced a pattern of dual earnership in a typical family. My daughters have benefitted from this changing pattern, which, alas came too late when Mangala was in her twenties and thirties.

But this argument does not justify my own relative inaction towards letting Mangala realize the full benefits of her talents. At the time of writing this account, there are many a forum on which her thoughts and actions are lauded. This has happened not because of any positive step on my part, but because Mangala’s family responsibilities have diminished considerably, thereby allowing her free time to exercise her talents. Thus my parents are no more and our daughters have left their nest and we are back to a family of two as we were in the first few years of our married life.

So looking back I feel that I owe Mangala a deeply felt ‘sorry’ for not letting her have the full satisfaction of realizing her talents.

\* \* \*

I have enjoyed popularizing science, following the example of Fred Hoyle. I have argued on some occasions that scientists receive their research grants as well as salaries from the taxpayer’s money and they need to ‘pay back’ part of this support by making society scientifically literate. By scientific literacy I do not mean knowing science, but, rather appreciating the powers of science and technology and having some feel for their benefits and destructive nature.

With the growing control of human life coming from S&T, surely it is wise to have some awareness of their capabilities, positive and negative.

My motivation for science popularization partly comes from both these reasons: to express my gratitude to society for supporting science and the anxiety that society becomes scientifically literate. Additionally I do it because *I enjoy doing it*. Just as I enjoy doing science, I wish to share its joy with the persons in the street (PITS)! I have discovered that the PITS are curious about the discoveries of science and about the wonderful or awesome tools generated by technology. But they need to be well informed. I have narrated in earlier part of this account how the typical listener loves to get that information in the mother tongue. Which demonstrates that there is room here for narrators, writers, artists, even musicians to come forward and help out in conveying science to the masses.

Likewise, at the risk of being repetitive I wish to stress that science at school level, at least until secondary level, should be taught in the pupil's mother tongue. For it is a subject that is learnt by comprehension, not by mechanical memorizing. This calls for a two-pronged attack. Firstly, there should be willingness to teach in the local language and secondly, attractive science texts are made available in that language.

\* \* \*

Finally, a question I am often asked: Do I believe in God? The questioner invariably expects an answer in the Yes/No form. Most of my effort is spent in explaining why I cannot answer that way. This I do now. The entity identified with 'God' means so many different things and so the questioner's concept may differ considerably from mine. Thus my replying yes or no will be misleading.

I do not, for example, like the idea of a 'personal' God who fulfills your expectations (whatever they may be!) provided you make to the deity a suitable offering. For, imagine two students who are to appear in the board examination. Student A has studied throughout the year and is now well prepared for the exam. Student B never studied and now finds himself ill prepared. In desperation he goes to the local temple and offers the temple a donation of Rs 5 lakhs if he passes with a first class, saying that it may be used for purchasing a necklace for the idol.

Let us now analyse the above belief system of B. Suppose, he does get a first. Clearly he did not deserve it but by God's grace he got it. If God indeed

did intervene to help B is He any different than a corrupt examiner who would do the same for a financial consideration? Further, where is the sense of fairness that we come to expect from the ‘Highest Body’? Is it fair that while an industrious student A gets a first class because his preparations make him deserve the outcome while another lazy fellow B gets the same result by bribery? This is why I do not care for a God of this kind. I think, I have been influenced by Albert Einstein who has said:

*In their struggle for the ethical good, teachers of religion must have the stature to give up the doctrine of a personal God, that is, give up that source of fear and hope which in the past placed such vast power in the hands of priests.*

As a scientist, however, I am not alone in wondering why the laws of science are turning out to have a universality. Why do astronomers succeed in understanding distant sources of radiation based on their limited knowledge of science on the Earth? And, to go one step further, why does the universe show an orderly behavior controlled by the laws of science: in short, why is there order in the universe and not wholesale chaos?

With that question mark, which I think will remain with me for the rest of my life, I conclude my tale of four cities.

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*My Tale of Four Cities* is the English version of Narlikar's autobiography *Chaar Nagrantale Majhe Vishwa* written originally in Marathi. The book is divided in four parts. The first part represents the early years (1-19) in Banaras (Varanasi). The second describes the author's stay in Cambridge, England first as a student and then continuing as a Cambridge Don. The third part covers the 200 months in Bombay, that is, until the year 1989 when the author moved to Pune. The fourth part describes the post-1989 period in Pune, which includes the author's major achievement of creating a scientific institution of a unique kind. Known as IUCAA (Inter-University Centre for Astronomy and Astrophysics) this almost unique institution has already made a name internationally. The events, ambience, personalities that played significant roles in the author's life appear as the description unfolds. The author recalls his interactions with distinguished personalities like the philosopher S. Radhakrishnan, the writer E.M. Forster, scientists like Fred Hoyle, Paul Dirac, S. Chandrasekhar, politicians like Lal Bahadur Shastri, Indira Gandhi and Rajiv Gandhi, musicians like Narayanrao Vyas, architect Charles Correa etc. His time-span as described here covers the period 1938-2003, a period when there were significant changes in India on the political front, on the technology front and on the educational front.

**Jayant V. Narlikar** (b. 1938) is arguably one of India's most celebrated scientists, and is well known for his work on cosmology and theoretical astrophysics. Although long known as a non-believer in the 'Big Bang' model of the universe, his overall views on cosmology are taken seriously; so much so that he was once elected to the prestigious position of President of the Cosmology Commission of the International Astronomical Union. He has written textbooks in his field and they have been very well received. Besides he has written books in popular science and science fiction as well as on encouraging the scientific temper amongst the masses. These efforts of his were recognized through the Kalinga Award of UNESCO. Some other notable awards conferred on Narlikar include: Sahitya Akademi Award (2014) for his autobiography, Padma Vibhushan (2004), Adams Prize (1967), and Padma Bhushan (1965).

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