A REPORT ON TEP BANGALORE (OCTOBER 3rd – 9th ,2023)

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Introduction: --

The Talent Enrichment Program (TEP) organized by the Jagadish Bose National Science Talent Search (JBNSTS) was not just an academic journey but also a remarkable chapter of personal growth and camaraderie. From October 3rd to October 9th, 2023, our educational expedition took us to the heart of India's scientific excellence, Bangalore, where we had the privilege of visiting renowned institutions such as the Indian Institute of Science (IISc), Indian Academy of Sciences (IASc), Jawaharlal Nehru Centre for Advanced Scientific Research (JNCSR), Institute of Chemical and Biological Sciences (ICBS), and the International Centre for Theoretical Sciences (ICTS).

However, this trip was not solely about scientific enlightenment. It was a unique blend of academia and vibrant social interactions. Amidst the quest for knowledge, we forged meaningful friendships across diverse academic disciplines. Our shared passion for science served as a common thread that brought us together, transcending boundaries and fostering a sense of unity.

This report encapsulates the holistic experience of our TEP trip, from the hallowed halls of prestigious institutions to the dance floor of our bus. It reflects the intellectual and emotional enrichment that this journey offered, leaving an indelible mark on our academic and personal lives.

Experience: --

On 3rd Oct,2023, our marvellous, never forgetting Bangalore TEP was started by an enlightening speech of the president of the IASc. He described the journey of the IASc. Its establishment, contribution of C.V. Raman and the relation between C.V. Raman and Max Brone. Then another beautiful lecture by Prof. K. Singha. He described his educational journey and the interrelation between maths and physics. How close together they are!! And the difference between a correct teacher and

great teacher. After that Prof Reneee M. Borges captivated us by her excellent lecture on the eyes of bees and the hunting technique of a crab spider. How they are evolved asper the natural selection. I don't like the biology as more as the physics, chemistry, maths and computer sciences. But after this lecture my perception on the biological sciences was totally changed. This beautiful day was ended by the lecture of a physics professor (I can't recall his name properly sorry for that) on the hydrophobic nature, more precisely to be d=said why water and oil can't mix together. What is the underlying concept below this? He explained this thermodynamically as well as he told us some probable hypothesis(models). But none of the model get proper fitted with the experimental data. He also motivated us by saying," Maybe one day one of you among here, can solve this problem."

On 4th Oct,2023 at first, we visited the JNCSR. The campus was beautiful and well decorated with the green nature. We visited different labs and had understood the mechanism and the working model of different instruments and machines and their evolution process and their modifications. We saw the mass spectrometry, immunology, genomics, flow control etc process in their lab. We had seen the X-Ray imaging of the brain, tissue and the embryo of the rat. We also visited their stem cell lab. Then we completed our lunch at JNCSR. After that we went for ICBS.

In ICBS we had three back-to-back sessions on gene collection, cancer cell and its recovering therapy and at last stem cells. Then we visited the marvellous lab facility in NCBS. There we learnt mainly two things one is DNA sequencing and another is NMR process. In both the process we visited the labotory and understood the working procedure of those machines.

On 5th Oct,2023 it was an incredible day for me. Not only I learnt new things but also physics is my favourite subject in 11th and 12th and still now I love cosmology. In ICTS at first there was an introductory session then a lecture on condensed matter physics. After that we had a lecture on biodiversity and solving its problems by computational method. After the lunch we had two interactive sessions one was with Ph.D. scholars another was with a theoretical physicist Prof. Ashoke. The schedule

lecture plan was concluded by an amusing lecture on gravity, black hole, bending of light, information loss etc by an eminent professor (I can't recall his name). But he was an amusing one. His theoretical explanations and corresponding practical implications are just awesome. Then we visited the labs. We saw the Slering's Imaging process, turbulent flow in a soap film due to an object insert in it, gas chember and at last Van-DE-Graph generator. And then we visited the beautiful, large library. The library was so nicely decorated. It contains a lot of rear and precious books. I can even say the 5th Oct is the best day up to the 5th Oct.

On 6th Oct,2023 I can say it is the best day for me in the entire trip. I really enjoyed in the IISc. The big campus, various departments, the professors, research scholars etc really motivated me a lot. At first, we divided into three groups. Then we visited the supercomputer in IISc at computational and data science department. They gave us a nice introduction about the supercomputers, how they work, their inter-connections, RAM, CPU, GPU, and other specifications. We had also known that we can use it through our laptop provided (SNS in Linux) provided we have registered for a program in IISc. After that the co-ordinators gave us permissions to visit the campus. I visited the main building, Maths department, earth-science, applied physics and computer science and automation department. In CSA we had a back-to-back lecture started from the history of IISc, future computers (the in-memory computing and 2.5 D system technology), Game theory, Group theory, some still unsolvable problems in maths, view point of algorithm and the difference between mathematical solving and computational solving and at last the correctness in a computational code. I studied the automata theory before but after listening the lecture I get another excellent overview. At last, we had an interactive session with the faculty members and the Ph.D. scholars. I also get a clear overview of competitive coding vs research and understood that they are disjoint. Moreover, that was the most memorable day in my life still now.

On 7th Oct,2023 at first, we visited the Microsoft research lab and then NIMHANS. In the Microsoft research lab, the security was very high. At the time of entry, the authority gave us an identity card but unfortunately, we had to return it. Inside the research centre everything is automated.

The ambience is the perfect combination of technology and science. There we met Neeraj Kayal. I was very excited to see him as he is the Bhatnagar Award winner'2022. There was also lectural session and the speakers were really awesome. The first lecture was based on causality then cheap diagnostics using AI. After that natural language model and translation tools. At last, how AI is used to make good impact on society. All the lectures were very innovative and based on the application of the computer science. On the 2nd half of the day, we visited the NIMHANS. At first, there was a lecture on the NIMHANS, the faculties, the research program, the labs. We saw various labs there.

On 8th Oct,2023 we visited Mysore. This was another memorable day for me as it was the first time, I visited the anyplace outside the West Bengal without my parents but I enjoyed this trip a lotttt… I even can't find any words how to thank all teachers' and the JBNSTS authority. As Mysore is more than 150 km away from the central Bangalore, we started our journey early in the morning. In the bus we enjoyed a lot. We sang and danced along with the rhythm. At first, we visited the summer palace of the Tipu sultans. Then the buried place of the sultan. After that the main attraction Mysore palace. Then we visited the famous catholic church and at last, the Brindavan Gardens and the lighting show. We returned the guest house quite exhausted but with sweet memories.

On 9th Oct ,2023 the final day, I felt quite sad as our trip would get over within few hours. At first, we attended the lecture on chemistry but actually it was an interactive one. At first, madam described her journey (academic career) then the main topic of the lecture. She nicely described the alternative use of the catalyst in a chemical reaction and the properties of boron and its compounds. And the lecture was really mind-blowing. Then we visited the Raman Museum. The museum was full of colourful stones that Raman collected throughout his life-time. We also saw the Bina and the shells in the museum. Then there was an astrophysics lecture based on radio telescopes. Prof. nicely described the electromagnetic spectrum and the galaxy imaging, the inferred telescopes and the future radio telescopes.

Now the time came what we didn't want. Time to return back the home. The host of the IASc bed us and said," I will be very happy if all the 35 students sign on the JBNSTS-IASc TEP poster. "I shall never forget the picture of the poster after everyone's signature.

Expectations Before Departure:

Before embarking on the TEP trip to Bangalore, I had high expectations. I anticipated an opportunity to gain insights into the world of science and research beyond what my regular school curriculum could offer. I also expected to meet like-minded peers who shared a passion for learning and exploration. Additionally, I hoped to visit prestigious institutions and engage with experts in various scientific fields.

Academic and Mental Preparations:

To prepare for the trip, I conducted research on the institutions we would be visiting, their areas of expertise, and the research they were known for. I reviewed my textbooks and notes to ensure I had a foundational understanding of the subjects we were likely to encounter. Mentally, I remained open to new experiences and perspectives, aiming to make the most of this unique opportunity.

In-Field Experiences:

- **Indian Institute of Science (IISc):** At IISc, we attended illuminating lectures on cutting-edge research topics. The Supercomputer Research Lab at IISc was another revelation. Here, we were immersed in the world of high-performance computing, gaining insights into the development of supercomputers and their role in addressing complex scientific challenges. And the lectures were mind blowing. It covered the modern computer technology, the chip technology and also the design of the complier and the algorithmic efficiency.
- **Indian Academy of Sciences (IASc):** Our visit here was a hands-on experience. We had the privilege to visit the Raman museum which was full of precious stones various musical instruments and the scientific instruments. We also analyse those stones. From there my

perspective towards science totally changed. I understand that everything which are surrounding us has a scientific significance. And to understand that is the real scientific research.

- **International Centre for Theoretical Sciences (ICTS):** ICTS introduced us to the intricate world of physical sciences through informative presentations and laboratory visits. There we attended some lectures which were unforgotable. The lecture on the STR and GTR were just awesome and also the professor show some real life examples which are analogous those large scale experiments. This I loved the most.

Key Learnings:

The trip reinforced my belief in the power of curiosity and collaboration in the scientific world. It taught me the importance of practical application and the need for interdisciplinary approaches to solving complex problems. I also learned that scientific research is not confined to textbooks; it thrives in dynamic, real-world laboratories. And most of the solutions are hidden in nature. We have just to observe the nature keenly.

Fulfilment of Expectations:

One of the most exceptional aspects of the trip was our visit to Microsoft Research Labs, where we were exposed to cutting-edge technological advancements. Exploring this hub of innovation was an eye-opener, demonstrating how technology and research intertwine to shape our future. It was an opportunity to witness firsthand the transformative power of computer science and its real-world applications.

The Supercomputer Research Lab at IISc was another revelation. Here, we were immersed in the world of high-performance computing, gaining insights into the development of supercomputers and their role in addressing complex scientific challenges. It was a fascinating blend of computational science and engineering that broadened my understanding of the immense potential of technology in scientific research.

At ICTS, the Physics Research Lab provided a glimpse into the fascinating world of theoretical physics. Engaging with experts and witnessing the

research in progress reinforced the idea that scientific exploration knows no bounds. It was a reminder that curiosity and imagination are the driving forces behind groundbreaking discoveries.

Our visit to the National Centre for Biological Sciences (NCBS) introduced us to an innovative research landscape. Exploring the innovative research lab at NCBS highlighted the interdisciplinary nature of scientific inquiry, showcasing how biology and technology converge to address complex biological questions. It was a testament to the creativity and adaptability required in modern scientific research.

While the academic experiences were undoubtedly remarkable, the trip's multifaceted nature extended beyond the labs and lecture halls. Our visit to Mysore, with its rich cultural heritage, offered a delightful contrast to our scientific exploration. It allowed us to unwind, bond further with our peers, and appreciate the beauty of India's cultural diversity.

The talks and discussions throughout the trip were enlightening and thought-provoking. They provided a platform to engage with experts, ask questions, and delve into the intricacies of various scientific disciplines. These interactions further fuelled our passion for learning and inspired us to pursue excellence in our chosen fields.

Top Three Academic Highlights:

- **Visit to IISc:** The lectures and laboratory visits at IISc were invaluable. They broadened my perspective on research and the importance of academic excellence.
- **Interaction with ICTS Scientists:** Our interactions with scientists at ICTS provided a unique chance to see research in action. Their passion and dedication left a lasting impression.
- **Microsoft Research lab Experience:** My experience in the Microsoft Research laboratory is just magnificent. There I learn the future technologies . How computer science is used (specifically artificial intelligence) to boost the health sector and diagnostics . I also learned the causality principle and the application of it. We were also learned the possible drawbacks such as the computer isn’t able

to translate mixed language (means a language composed of two or more languages which we usually telling) and also learned the possible solution. At the lunch session we also had an interactive session with the research interns there and the working domain. And also we had a discussion the hot topic, " Is A. I. tread to us or not. "

Experience with friends:

The experience of being with my peers during the TEP trip was truly delightful and enriching in more ways than I had initially imagined. Beyond the confines of the educational visits to prestigious institutions, our journey became a vibrant tapestry of camaraderie and shared experiences.

As we explored the cultural marvels of Mysore, our bonds grew stronger. The dance party that spontaneously erupted within the confines of our bus was a testament to the unity we had fostered. In that moment, under the sway of music and laughter, we transcended the boundaries of our respective disciplines. Engineers, doctors, and students from various branches of basic sciences all came together as one harmonious group, driven by a collective passion for learning and adventure.

Our interactions were not just limited to the dance floor; they extended into meaningful discussions and knowledge sharing. I learned a great deal from my newfound friends, gaining insights into their respective fields and broadening my horizons. This cross-disciplinary exchange of ideas underscored the value of diversity in thought and perspective.

Most importantly, this experience emphasized the importance of teamwork and collaboration. We supported each other in both academic pursuits and personal endeavours, reinforcing the notion that together, we could achieve common goals more effectively. Through these friendships, I discovered the beauty of interdisciplinarity and the profound impact it can have on personal and academic growth.

Logistic Arrangements:

The logistic arrangements were meticulously planned. From our journey starting at Kolkata Airport to our stay at IASc Jalahalli and the cultural and historical visits, everything was well-organized. The accommodation was comfortable, and the food arrangements were satisfactory. I also enjoyed the local food also.

Interaction with JBNSTS and IISc Organizers:

Our interactions with the organizers from both JBNSTS and IISc were exceptionally positive, enriching our experience throughout the TEP trip. From the very beginning, they demonstrated a high level of approachability, making themselves readily available to address our queries, concerns, and needs. This accessibility significantly contributed to the overall smooth and enjoyable nature of the journey.

One notable aspect of our interactions was the level of autonomy we were given to explore and engage with the facilities and departments at IISc. We were encouraged to explore their Supercomputer Research Lab, and various departments with a sense of independence, allowing us to immerse ourselves fully in the scientific environment. This trust in our responsibility only enhanced our sense of ownership and connection to the academic exploration.

The research lectures provided during the trip were a definite highlight. These lectures were not just informative but highly interactive. We were given the opportunity to engage in discussions, ask questions, and gain a deeper understanding of ongoing research. This open exchange of knowledge was a testament to the commitment of the organizers in facilitating our academic growth.

Furthermore, the efforts made in organizing both the educational and cultural aspects of the trip were commendable. From the well-structured

itinerary to the seamless logistics at every step, it was evident that the organizers had invested considerable thought and effort into ensuring that our journey was educational, enriching, and enjoyable.

In sum, our interactions with the organizers from JBNSTS and IISc were marked by their approachability, trust in our exploration, and their dedication to providing an immersive, educational, and memorable experience. Their support and meticulous planning were pivotal in shaping the success of our TEP trip, and their contributions are greatly appreciated.

Suggestions for Improvement:

I can't say to improve this. Everything was nicely covered. The hospitality of the guest room manager and the cookers are just awesome. And the coordinating teachers are very helpful and kind . They took care us which we rarely get in the home also.

I want to conclude this report by saying, " *On 3rd October when I started our journey I hardly knew anyone in the trip but on 9th October when we returned nobody was left unknown. From IISc to Mysore, from lecture hall to dance party, from academic to friendship everything was nicely covered in this trip.* "