TIME IN SCIENCE AND LIFE

The greatest legacy of Albert Einstein

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First published in Great Britain in 2009 by
PRACTICAL BOOKS

Published by Blankson Enterprises Limited
4 Poplar House, London
SE4 1NE
www.practicalbooks.org

ISBN 13: 978-1-4092-6809-3

A CIP catalogue record for this book is available from the British Library.

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PROLOGUE[1]

"I want to try to convey to the reader what is involved in the new phrase 'space-time', because that is, from a philosophical and imaginative point of view, perhaps the most important of all the novelties that Einstein introduced." (Bertrand Russell, ABC of Relativity, Ch. 5.)

Some readers of this book may find the exposition somewhat difficult because it hovers between an admixture of technical details about time, drawn from Einstein's theory of relativity, and elementary consideration of time's general nature as it appears in daily life to everybody together with its passage and continuity.

Time alone is uniquely suitable for this kind of treatment since we are all using time every second of the day. And it will be recalled that Bertrand Russell pioneered (and made acceptable)[2] this kind of philosophical literature with his *"History of Western Philosophy---and its connection with Social and Political Circumstances from the Earliest Times to the Present Day"*.[3]

The technical aspects of the book are based on the concept of space-time which was introduced just over a hundred years ago. It was a new theory of time originally proposed by Einstein in his special theory of relativity. As a theory of time, it is, of course, very important, quite plainly of greater concern

[1] In this monograph, the terms 'space-time' and 'time' are to be understood as quantified time, involving mathematics in their derivation. Alternatively, time is always 'how much time'---see Appendix I.

[2] According to the eminent scientist and first Director General of UNESCO, Sir Julian Huxley, "Bertrand Russell's remarkable book is, so far as I am aware, the first attempt to present a history of Western Philosophy in relation to its social and economic background…"

[3] It may be said that this is a theory of time and its connections to human life and survival since religion is involved in all theories of time.

to mankind than any other aspect of relativity. It is not surprising that, as the reader will learn from the text below, Einstein said he completed special relativity only five weeks after he discovered the significance of 'local time', which we know as 'space-time'.

Unfortunately, Herman Minkowski later amended the Einstein theory, calling his own idea also 'space-time'. I think the Minkowski theory is false; but, as the *first* mathematical interpreter of relativity, refuting him is made difficult by scientists saying they cannot understand relativity without him[4]; yet since his mathematical formula for space-time needs to be shown to be logically invalid before the problem of the passage of time can be resolved with the original Einstein notion of space-time, I will begin with the following observation from another great scientist about Minkowski's lack of logical credibility to affirm that philosophers have good reason to question his version of space-time, namely: in a rather surprising, indeed shocking, gaffe the well-known eminent expert on relativity, Professor Sir Arthur Eddington, declared the Minkowski theory to be fictitious in his "Mathematical Theory of Relativity" (Ch.1.1.), yet insisted that "…*we shall continue to employ it; but we must endeavour not to lose sight of its fictitious and arbitrary nature*."[5] I think

[4] Scientists claim that "Minkowski's geometrical description undoubtedly improved the clarity of the special theory and is still regarded as the best way to understand it." (*New Scientist*, 2nd Jan. 1993.) They forget that philosophers ignorant of Minkowski nevertheless understand Einstein's theory of space-time, which Minkowski said he had converted to geometry, and which is the central issue in this book. The trick is to take it as "time, pure and simple", as Einstein directed---see below for more details.

[5] The emphasis is mine. I have dutifully, on my part, shown in the text in the clearest way possible without ambiguities as to the reason the basic mathematical equation of the Minkowski formula renders his theory fictitious and arbitrary without the possibility of redemption. The surprise is that Eddington of all scholars, and a great mathematician himself, the world-famous Professor who wrote *The Mathematical Theory of Relativity*, advised scientists to continue to use it. And they have dutifully done so, to the detriment of relativity theory, as it has resulted in a distortion of Einstein's basic ideas about time.

somebody should have reminded the erudite professor that, as a result of his own realistic assessment of the merits of the Minkowski formula, logicians and philosophers would regard the mere mention of it, (and all deductions based on the theory), not only as unacceptable but a distortion of relativity, let alone part of natural law as it is still regarded in mathematical physics, thanks to his own requirement that mathematicians should use it.[6] We need to know why it is used if it is fictitious as he states. Of course, in theoretical physics false theories may not lead immediately to catastrophes on earth, nevertheless, it is completely and utterly unacceptable as it will cause confusion in subsequent suppositions in philosophy and physics.

The original Einstein theory of time leads to the following premises for discussion upon which all the suppositions in this book are based.

1. The Einstein theory of time (as space-time) makes time discrete; and the earth-year, which is the source of all units of time on earth, has always been discrete, so there is conformity, much to the delight of philosophers. The second merit is that it accords, also, with Professor A.N. Whitehead's philosophical definition of time as 'one moment', then another, and another *ad infinitum*---as the year's succession shows---otherwise we couldn't have time in units, in the absence of a universal time frame, where the universally applicable time units (of unknown provenance) were supposed to be the same everywhere. Under the Einstein new theory of time we can't help having time in units because the basic unit, which is the year, is just one unit (or moment) of time from which all other units of time are obtained with points, added to a number of

[6] Scientists who waste our time with claims that a time machine is theoretically possible should try to define time first without Minkowski. For if the Minkowski 4-D geometry is fictitious and arbitrary then a time machine is impossible, because it means the Minkowski space which is used by these speculators in their theories does not exist---in fact, could not exist.

concepts, and mathematics---including day and night, and the monthly cycles.
2. Russell too is right to call time 'relation between points', for that is how we get the year itself as also a discrete (or one) unit of time. Many of the theories of time are pragmatic; they are simply inferred from the practical uses of time. 'Relation between points' is one of them; for it is nothing but a straightforward description of the essence of the earth-year, being the conditions in nature that, logically, result in the year's existence. It is, however, a very clever inference that I find indispensable. Otherwise, the only truly new concept is the Lorentz notion of local time, or t^1, an alternative to 'time' that is created locally, which Einstein referred to as 'time, pure and simple'---and then the debate began in earnest; for it showed that time is not one immutable entity in the cosmos as previously supposed.[7] And this is the really serious debate about time in all history, as I have discussed in the book.
3. The passage of time can be logically inferred from the Einstein theory, because discrete time proceeds by the procession of its units---the years, for instance: year after year after year, leading to the centuries. Also, there is no unit of time that does not replicate itself to pass by---i.e. second, second, second; minute, minute, minute, and so forth.
4. By the same Einstein theory, the problem of perpetual time is easily resolved---i.e. due to the succession of time units.
5. Space-Time requires points; it shows that man contributes something to the having of time—we invented the point.
6. A unit of time is totally indefinable in logic on its own, without which knowledge it can never be replicated elsewhere. How can we define the year logically so that it can be replicated some where else in the cosmos exactly? Therefore the units of time derived from the earth-year cannot be created anywhere else without a metric in which the earth-year is pertinent. This simple rule carries serious implications for

[7] The Einstein analysis of simultaneity confirmed that time is not one unchangeable thing permeating all the cosmos, and that every 'body' can create its own 'local time'. In the history of the world this is the most revolutionary idea of all time.

cosmology. It means earth time cannot be valid in the metric of general relativity, because the periodicities created with the earth's motions are unique and limited to the earth, no matter what mathematics are employed. We cannot even use mathematics because we do not know how to define the year in the abstract. To use the Minkowski formula for 4-D geometry is even worse, since he relies on imaginary elements, thus creating a fantasy. I consider this rule so important that it will be repeated throughout the book to remind readers of the limits placed on earth time by the theory of relativity---special and general.

7. In the absence of a universal time frame (or time reference), I have discussed how our time began as a union between the sense of duration in the mind and external cycles; but it must never be supposed that we are creating time units through a link between the sense of duration and external repetitive cycles every day, or as we go along. This was done but only once by inventors. Thereafter we mechanised the resultant *quantified tim*e in the clock, and use it without thinking about the metaphysics of how it was created. Of course, I have repeated this idea more than a dozen times in the book to try and instil it permanently in people's minds, due to its novel and shocking nature---for it is to be understood that it is our only means of having time *in the universe all over*;[8] in other words, everywhere and anywhere, human beings (or any beings) can only have time by this method. I pray that the reader will recognise my good intentions and ignore my deliberate literary crimes!

8. Time dilation was a puzzle before relativity, simply because it was assumed in those days that time was general, with a

[8] Creating units of time with external cycles that are recognised in the mind as distinct "periods" is the basis of logical time. Yet time, all time, has to be logically constructed to accord with physical reality. No 'Beings' anywhere in the cosmos can get units of time by any other methods---it would be illogical and therefore would not work as well as our time; and since life depends on rational time---one that accords with physical reality---no illogical time would be promoted permanently anywhere in the universe. This may be seen as laying down the law on time for the entire cosmos; but then logic is the law of thought in the cosmos.

standard time frame running through all the universe and the same everywhere---that is why Lorentz's discovery of t^1 (being a different time previously unknown), puzzled everybody. After relativity with its discrete dynamic time, the mystery vanished, or so we thought!

In concluding this Introduction, I like to say something about 'the law of thought in the cosmos' mentioned above, because in philosophy nothing is ever left without definition. What do I mean by the 'law of thought in the cosmos', giving rise to logical time? Secondly, what at all is 'logical time', and why might it be better than any other system of time? This is important as it has a bearing on the whole argument in this book, which argument is that there is a human contribution in the process by which we have our time; therefore our time is peculiar to us here on earth and not applicable to any other part (or metrics, including that of general relativity) of the universe. And I think we used the law of thought in the universe for creating or inventing our time; so that any 'Being' in any part of the cosmos will have only that law available for creating its time, but its time will be different from ours due to the peculiar postulates applicable to its metric. I hope this is clear. In philosophy such clear definitions are obligatory.

The idea is that the thinking will be logical in the sense that it will accord with physical reality, which will, in turn, lead to the having of time that is strictly logically in tune with reality. But how can a tiny and inconsequential earthly creature such as I am, lay down the law about thought for the entire universe? The reason is that all thinking is logical thought, in the sense that, good or bad, it is about things and their properties perceived, imagined, or even assumed as in mathematics---as it is also about situations, metrics and milieu---so as to accord with the physical reality to which it will be applied. Therefore, using this method of thought (or logical thought), any 'Beings' in the cosmos will have to have units of time by which to live rationally in conformity with physical reality as spread out in nature before them; the

creation of the units is the important thing; for all time has to be quantified otherwise there would be no units of time (the years, hours and seconds, etc.), without which telling the time would not be possible. The units of time constitute the time, for time is known and used only in units. Thus creating the time units is to be understood as the same thing as ‘creating our time metaphysically’. Hence, through this process of logical thought, every ‘Being’ will have to invent its time units, and that can only be achieved with external cycles like the year and its subdivision which constitute our time here on this planet as logical time completely in accord with the external world, or reality for short.

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ONE

A word about counterintuitive mathematics

Basically this little book is concerned with the violations of the logical rules of thought inherent in the Minkowski theory of space-time, so much so that his theory is called fictitious, yet it is in daily application in science, even in the physics research laboratories; one wonders how much damage has been inflicted on science to distort it since Minkowski. His followers (practically all pure mathematicians) think the theory is logically sound and therefore refer to all physical reality as a metric of four dimensions.[9] In fact, it has no logical basis and works by presumptions, assumptions, and the assignment of imaginary quantities as is common in pure mathematics. Subjected to rigorous logical analysis, the theory's hollow logical foundation means that all the deductions based on it are flawed and do not reflect physical reality when we take away the assumptions, presumptions and imaginary quantities. For instance, space and time are still separate entities because they pass through nature separately, despite the many assumptions based on the Minkowski theory to try and make them one entity.

My main worry at present (at the beginning of this book) is that often we hear that something is counterintuitive, or relies on counterintuitive mathematics, with the warning that those inexperienced in mathematics should not try to imagine the

[9] In practical technology any idea so logically flawed does not have to be refuted; it simply won't work. But in theoretical physics, competing, even contradictory, theories will enter textbooks---as is happening now with the 'Strings' and 'Super Strings' suppositions---because pure mathematicians can work with any idea as they don't have to show that it works or will work in practice.

physical processes involved. The complex nature of the mathematics employed by Minkowski falls into this category. He starts with his complicated ict equation, then throws in the equally complicated geometry of flat four-dimensional surface, and end with the well-known geometric equations of Pythagoras, just to assume (there is no proof) that space and time are part of one four-dimensional entity.[10]

Contrary to the general belief of mathematicians, the Minkowski formula is not that difficult to understand or refute. In special relativity the equation for motion consists of four factors, elements or parameters. These were the three standard facets of physical reality and space (height, width, and length) plus time as also a co-ordinate. This was new; time had never been considered as part of physical reality before. What Minkowski did was to incorporate time into the natural physical facets of space---not as an addition to them as Einstein had made it. If true, this formula can easily be seen to make a good simplification of the Einstein proposal. Without any proof mathematicians seized on it as inherently true and irrefutable; sometimes they even clothe it with authority, and say, "as predicted by Einstein".

The problem is exactly as stated by Professor Eddington in his definitive book on the mathematics of relativity, *The Mathematical Theory of Relativity*, which I am relying on (in part) in this book, namely the Minkowski "partitions of space and time" are exactly "like the lines of latitude and longitude drawn on the earth" (Ibid page 8.) That is to say, in plain language, "imaginary", and Eddington added that it should never be forgotten that it is imaginary, but useful. I personally can never understand this. If something is not true of the natural world, how can we use it to theorise about the natural world and get things right? Of course anybody can solve any problem if this is acceptable. For time is not imaginary. It is

[10] Yet it rests totally on his imaginary quantities as Professor Eddington has noted; therefore it was just an assumption. Mathematicians are fond of this; they would maintain that it would be up to the applied mathematicians (or physicists) to supply the physical deductions to confirm or refute their suppositions.

second in importance only to life itself; and as a physical co-ordinate as Einstein made it, it becomes vitally important in cosmology, psychology and philosophy---all of which are distorted when it is considered as integral part of space with imaginary quantities.

Yet still, for their crimes, which is that of the rigorous and strict pursuit of abstract logical thought, philosophers are usually ridiculed for not realising that something is counterintuitive. I expect to be similarly accused. The common joke is that when you corner a scientist he or she appeals to counterintuitive mathematics, and accuse you in turn (often rudely) of ignorance of that.

So it will do no harm to point out from the beginning that we know of counterintuitive mathematics. But it is not built on thin air. It merely means that the physical reality supporting certain mathematically induced concepts cannot be visualised. In parts of Bertrand Russell's classic interpretation of relativity (ABC of Relativity), he warns the reader not to try to visualise what he was describing about general relativity. Counterintuitive mathematics does not mean the foundation of the deductions or reasoning in a presentation (whatever it may be about), can violate the requirements of logical accuracy and validity; and the ultimate test of logical validity is "to exist". By this criterion the Minkowski 4-D geometry is fatally flawed. His imaginary time co-ordinates must have logical basis in physical reality---which, unfortunately, they do not have. The theory is flawed beyond salvation. Thus counterintuitive mathematics cannot be used to shield him. After all, it is much more difficult, intellectually, to write fundamental theories about the nature of physical reality without formulaic mathematics. The advantage is to avoid formulaic concepts that, on closer scrutiny by critics, might turn out to ruin a thesis.

The problem for the professional mathematician is always knowing what to do (what to use) other than existing formulas. The subject is so vast and complex the dictionary runs into nearly five hundred pages; no mathematician can master but a

few branches of it in a life time; then, also, there are the unavoidable formulas. Von Newman put it best: "I know mathematical processes that I have used with success for a very long time, of which neither I nor anyone else understands the scholastic logic".[11] I don't think such formulas should be admitted without clear explanations of what they mean in what may be described as "Fundamental Papers". Perhaps the academic journals and their peer review referees could device a system that demands logical definitions of formulas in Fundamental Papers. That may help to stem the avalanche of papers by crackpots based on formulas so established that they are difficult to assess. Philosophers are often tasked to police science; more appropriately with the ethics of proposals; but they can also be helpful with definitions. We need to encourage mathematicians to cure their inherent mystical streak, which dates back to Pythagoras, and in which some mathematicians take enormous delight.

As always, Bertrand Russell deviated from the norm, and seems to have got it spot on. "There is a special department of hell for students of probability", he teased mathematicians half jesting in his Novel, *Nightmare of Eminent Person*. But at the end of his long working life, in My Philosophical Development, he rejected the Pythagorean (mystical) streak in mathematics, when he wrote in his essay, 'Retreat From Pythagoras': "Mathematics has ceased to seem to me non-human in its subject-matter. I have come to believe, though very reluctantly, that it consists of tautologies. I fear that, to a mind of sufficient intellectual power, the whole of mathematics would appear trivial, as trivial as the statement that a four-footed animal is an animal. I think that the timelessness of mathematics has none of the sublimity that it once seemed to me to have, but consists merely in the fact that the pure mathematician is not talking about time…"[12] About

[11] W.W. Sawyer in *Mathematician's Delight*, Penguin, 1967, p 216.

[12] Right now because they adhere to the supposition of Minkowski that time is inherent in every space, mathematicians never forget about time; but here lies another problem---supposed Minkowski was wrong? Already a large number of the intricate suppositions of the so-called interpreters of

forty years earlier in *Mysticism and Logic* he had written, "Pure mathematics consists entirely of assertions to the effect that, if such and such a proposition is true of *anything*, then such and such another proposition is true of that thing. It is essential not to discuss whether the first proposition is really true, and not to mention what the anything is, of which it is supposed to be true. Both these points would belong to applied mathematics." I believe many of the problems in fundamental science are caused by slavish adherence to formulas.

Presently, we are told by the interpreters of general relativity that every possible solution to the problem of linking general relativity to the quantum meets with mathematical road blocks. Maybe we should look at the formulas of the mathematical roadblocks in some critical depth.

Time for me is time in the clock; the philosophy of time for me is how it gets (or got) there---i.e. into the clock. Also, as far as I am concerned, mathematics grew from the human cortex and it is still growing in there into higher complexities; but however complex, I think its origin is in perception (this is what made Plato so alluring, but he was wrong, as the quantum shows that visual perception is of quanta and of quanta alone, and the other perceptions are also equally accounted for by the collocations of atoms, the existence of which is proved by the perception of its parts as quanta. If the atom did not exist there would be no quanta of energy as parts of the atoms radiating about, and these quanta are seen plainly as the particles of light; and since we see only by means of light, it is now supposed that what we absorb to see the world are the quanta themselves as the smallest pieces of matter in existence, giving us the surface images of things in the Berkeleyian sense.)[13] These are the fundamental ideas of

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general relativity seem to me really bizarre, mainly because of the way they handle time, or space-time, as a union between time and space. It is completely against logic to say time and space are unified because the time is obtained from space as the offspring thereof, but like all offspring, separate and independent of the parent.

[13] The Berkeleyian theory I have in mind is this, and I quote from Russell's *History of Western Philosophy*, Book Three, Ch. 16: "Berkeley advances

matter and reality upon which the philosophy of science (or of physics) is based for a truly material account of the external world---that is why physicists are seeking the Unified Theory of Everything; they believe it is there somewhere hidden in the atomic structures of the world. Of the existence of atoms we have visual proof of its parts in the quanta because we can see light plainly without theories.[14] But we need to scrutinise (critically) some of the mathematical formulas forming the road blocks in depth; the obsolescence of some of them may frustrate developmental efforts in some branches of science.

The eather debacle illustrates clearly that formulas don't always work. This is mainly because you start, as in the works of pure mathematicians, with the assertion that because something is so-and-so, you have to proceed in such and such manner. Unfortunately scientific knowledge is always changing; there are so many journals that nobody ever knows what are passing through all of them at any one time; on top of that, most of these formulas are very old. If any of them have been refuted, challenged in a manner that deserves attention, or rendered inaccurate by other propositions, you may not know, for no one has super human intelligence. In the end, your own proposals and others like yours either lead a subject astray (as the Minkowski 4-D geometry is doing to cosmology), or appear to be defective as if you are a sloppy

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valid arguments in favour of a certain important conclusion, though not quite in favour of the conclusion that he thinks he is proving. He thinks he is proving that all reality is mental; what he is proving is that we perceive qualities, not things, and that qualities are relative to the percipient." In relativity parlance, "We perceive the surface quanta (as images, qualities, etc.) of things, and not the things in themselves".

[14] The fact that we see light makes the quantum even more important and mysterious than its dual nature, zero rest-mass, tunnelling, and so forth. For thousands of years man believed that nothing in the world is perceived plainly in its essential form. But here are the quanta; they appear to be the basic forms of matter and radiation and energy (or whatever) and we see them; in fact we can see nothing else at all. The task now is to work out how we see bulky matter and their images from the small bits of them (as quanta) that enter the eye. It is important as it has the potential to make the Platonic theory of Ideas redundant.

thinker.[15] It does not help that in technical subjects most of the journal referees are ruthless mathematicians. They are Pythagorean at the best of times, meaning that they tend to be mystical; but when they are ruthless on top of that then scholars have something like Satan with no interest in the physical world judging their works.

Scholars, particularly in philosophy, must be encouraged always to consider whether formulaic mathematics and concepts are worthwhile. To avoid them and still win is the ultimate test of originality---the prime example of which was the Einstein theory of relativity. He had no such problems with special relativity; but in general relativity, he adopted the Minkowski space-time theory---with its central notion of curved space-time---which is now found wanting. It still cannot affect the basic idea in general relativity, which is the curvature of space, but certain ideas about time are clearly erroneous because space is *not* the same thing as time---time is completely independent of space, but it is still 'space-time' because it is derived from space with points or mathematics. No doubt, before Einstein, as Professor Eddington has observed, nobody thought about time in this way. The task now is to examine our traditional legends of time to see which of them must be discarded---yet we are not doing that. Time is everywhere discussed still (even in scientific laboratories) as our grand fathers did, with the exception that the Minkowski proposal has been grafted onto heaps of myths to make time even more mysterious than it was in the Dark Ages when religion dominated human thought.

[15] As a formula, thinkers are only required to cite "The Minkowski Space" as proof that all time is space-time and all space is also space-time in the sense that space and time are unified into one entity with the Minkowski ict equation---therefore, as a consequence, s=ct…

TWO

Physics and philosophy

From the ideas discussed in the preceding section, we come now to the study of physics and philosophy proper. To my mind, the pivotal core of any system of philosophical and scientific ideas, however complex, is almost always simple, at least in outline. Even the great philosophers are remembered for what we now regard as simple observations, as they have been developed and passed down in books, even elementary school books. To give a rough selection of the most obvious examples, we begin with the father of them all, Plato. His basic philosophy still dominates Western Thought, as they say, even though the quantum theory has made it redundant as will be explained in another section of this book. But Plato was ingenious. He sought to explain perception and the existence of universals with one clever supposition: the theory of Forms.[16] That is to say, how the external world enters our minds and what makes some ideas generally applicable throughout the world, were serious problems solved at a stroke with Plato's supposition. This is known as the problems of perception and universals. He may be regarded as the greatest or the father of them all because he was ingenious enough to realise in those early days that knowledge of the external world (the beginning of physics), and how ideas become generally applicable (logic and mathematical concepts) were the most important in philosophy. He supposed that we are born with their 'Forms' already in the mind. Reality merely activates them, or brings them into play. The whole of Plato's

[16] It is interesting that the Platonic 'theory of forms', and Einstein's 'theory of frames', both destined to dominate our intellectual world, are also remarkably close in phonetics.

legacy is based on this simple idea, appropriately called, "The Theory of Ideas". As such, because he was philosophically very clever, Plato is the best introduction to the study of what philosophy is, and what philosophers do. Gradually the student will be taught what changes have been made to Plato's theory of Ideas, or Forms as 'footnotes' to Plato; what can be retained, and what must be abandoned---although in philosophy alone it seems nothing is ever abandoned. One man's meat is another's poison; and one man's rejected philosophy (cleverly disguised by self-seeking gurus) may even become the sacred theology of the whole multitudinous population of a continent, even a number of them, if not in every one of them!

Another prominent example is Aristotle, the foremost disciple of Plato. That alone makes Plato almost as supreme as Einstein as there might not have been Aristotle if Plato had never existed. Aristotle, warts and all, is probably the greatest thinker of all time; discovering syllogism was more than enough for this title, but going on to apply logic to the study of nature qualifies him for the title of god---the god of human thought, maybe. If he had been a Jew he might have been worshipped as a Messiah, as Einstein should have been to end all anti-Semitism, if the Jews of his era were wise, instead of offering him the poisonous chalice called 'President', which he was wise enough to decline on the very rational grounds that politics is far more complicated than physics.[17]

The core of the copious ideas of Aristotle was that the universe (or the world of sense) is organised logically where

[17] Einstein was not only one of the greatest scientists of all time, like Newton or Copernicus. He was more than that. He was unique; he changed our conception of physical reality with his theory of frames alone, and there was more, much more. As the British Nobel Prize winner, P.A. M. Dirac, put it: "His theory came out of the blue. And it did not follow from what had gone before". The highest intellectual accolade is the credit for changing a subject. But Einstein changed our very concept of physical reality itself, not just physics. And he did it not by study, but by an ingenious insight such as we suppose to be the prerogative of a Deity telling his sinful earthlings to do things differently.

one thing leads to another ad infinitum, but always starting from one pragmatic base: for example, there are trees; but they require the earth to stand on. Find out the logic of this process, and you get plant physiology, the logic of plants, or logic as applied to plants. All science is based on this Aristotelian system of logical analysis. Aristotle taught us what logic is with his syllogism; next, the application of logic, which gave us subjects like geology, biology, physiology, psychology and so forth. The main body of his technical philosophy consists of the elaboration of 'the logic of things', apart from writing on ethics and politics. So we may say that the core of Aristotle's ideas was that things are logically organised. It is still the foundation of scientific knowledge, including mathematics---the whole of mathematics consists of logical deduction. As logic has developed it has come, more and more, to resemble mathematics; examined in depth, mathematical reasoning is always a process of logical deductions.

In science proper we are obliged by tradition to use Newton for illustration of the notion that the core of the ideas of all great thinkers may centre on one simple and yet ingenious insight. From Newton we get the laws of how things move in the universe, namely, the Newtonian Three Laws of Motion: "Sir Isaac Newton founded the study of mechanics by setting down *simple* laws by which the planets---and all matter---move…" (My italics.)[18]

And so we come to the consideration of the most ingenious, most surprising, most exciting and the most accurate of them all---Albert Einstein. Let us first agree that his output was phenomenal. He ranged over the whole of physics; unlike the others, he did not have just one, two, or three brilliant ideas. In fact, the discovery for which he won the Nobel Prize for physics is hardly mentioned nowadays; yet it was for extending the quantum theory to all matter and all energy. As strange as the quantum appeared to be, to say that all energy is similarly emitted, absorbed and transmitted was a bombshell.

[18] From *The New York Public Library Science Desk Reference*, Ed. Patricia Barnes-Svarney. A. Stonesong Press Book, Macmillan, USA, 1995 .

The Planck Constant itself was regarded as the most ingenious discovery of all time in the study of physical reality and physics was struggling to come to terms with it; but to extend it to all matter and all radiation in the emission, absorption and transmission of energy with his light quanta hypothesis (quickly confirmed by the photoelectric effect), was perhaps uniquely unclassifiable genius; nothing like that has happened in the history of the world before, and nothing is ever likely to be greater than his achievements. The quantum theory, as I will presently explain in another section of the book, can be interpreted to mean that seeing is not by means of images (inside or outside the mind), but by the absorption of quanta, the smallest pieces of matter that can exist from the human point of view. It leads to the supposition that 'Naïve Realism' may very well be neither naïve nor as vacuous as some critics might suppose. For we see light. Light consists of the smallest parts of the material of things in radiation with, naturally, their exact forms or images and colours; and we know that all quanta are naturally coloured. So I may be naïve but I think I see reality plainly in the forms of quanta imagery.

However, ordinarily what we remember Einstein for, as his most startling ideas, were basically just two simple insights. They were not simple by any means, but just looked like ideas even of a simpleton. They were the theory of frames that the universe is not one coherent body but consists of a multitude of fragments for the special theory of relativity, and the concept of the curvature of space for the theory of general relativity, which said gravity is not a force but arises from the curvature of space caused by the presence of massive bodies---or mass for short. Concerning his theory of Frames with which Einstein solved the problem of time dilation among others[19], this is what Professor Abraham Pais had to say in his Biography "Subtle is The Lord…" (Chapter 7): "There are as many times as there are inertial frames. That is the gist of the June paper's kinematics sections, which rank among the highest achievements of science, in content as well as in style.

[19] This is discussed in another section below.

If only for enjoyment, these sections ought to be read by all scientists, whether or not they are familiar with relativity. It also seems to me that this kinematics, including the addition of velocity theorem, could and should be taught in high schools as the simplest example of the ways in which modern physics goes beyond everyday intuition".

Following from the discovery that every body has to have its own time, there is no doubt that under relativity 'individual time' is the individual creation (or invention) of an individual body. People have overlooked the importance of this, except the experts like Russell, who noted that space-time is the most important of all the novelties Einstein introduced. The reason is straightforward. *How do these individual bodies invent their own times?* This question is as profound as that about the origin and purpose of life. We have lived for thousands of years believing that time comes to us from the cosmos---or God, if you like. Now experiments have shown that it does not. How did we invent our time---like those of other bodies in the cosmos? Well, for my part, I have adopted the definition of space-time given by Bertrand Russell, and so regard time as "relation between points", and therefore necessarily discrete. This is the logic with which I think the passage and continuity of time can be solved as discussed all through this book.

The theory of frames was just one of Einstein's successive brainwaves[20], commonly (even universally) regarded as the most surprising of which was the curvature of space for general relativity. All human beings regard news of the cosmos with awe; otherwise I would have thought the theory

[20] There were also the $E=mc^2$ equation, the light quanta hypothesis, the wave-particle duality for quantum mechanics which he solved in one sentence when referred to him by Louis de Broglie's professor, saying, 'I believe it is more than a mere coincidence' (as always with Einstein, other writers put what he actually said different, thus: 'I believe that it involves more than a mere analogy'. The important point is that he approved the wavicle notion with one sentence to set quantum mechanics on its way to dominance.) Also there was, our main concern, the Lorentz local time idea which he extended to all time, calling it 'time, pure and simple', and so forth.

of frames, to the effect that every frame is different with different natural laws was, perhaps as Professor Pais implies, more ingenious. As noted below in another section, he solved so many outstanding problems in physics with that one supposition alone, the core of special theory of relativity, which is regarded as proved: the world is not one coherent body but consists of a multitude of fragments, each with its own natural laws. Our frame's natural laws begin with the two postulates. Professor Pais is right because I think when the study of Einstein's ideas is approached from the point of view of the two postulates and inertial frames, special relativity is easier to understand. Likewise, general relativity and gravity without a force is easier to understand when approached from the notion of the curvature of space, and Riemannian geometry.

Now we come to the man who was said to have phenomenal intelligence, the English philosopher, Lord Bertrand Russell.[21] Einstein and Russell were contemporaries who knew each other pretty well, says Russell in one of his Nonesuch literary recordings (1962), and I quote from fallible memory: "Einstein, whom I knew very well, was an extremely loveable man, absolutely devoid of the slightest pretensions. You might have met him in the Train without knowing he was distinguished. The most loveable man I have ever met". Bertrand Russell was the greatest philosopher of the last century, not only in England but the world.[22] It is from Russell

[21] In his Autobiography he confessed that he was sent to Military Crammers. Those who know how they operate may ask whether this phenomenal intelligence was latent to be woken by the Military Crammers, or the Crammers forced him to become that clever---i.e. to escape their merciless punishment. Whatever the truth maybe, I recognise the event as having a bearing on how the brain, or mind, works, especially in relation to the emotionally-charged debate about race and intelligence.

[22] Some writers believe the title belongs to Professor A.N. Whitehead. I agree that he was a deeper thinker, but the range, style and output,, wit and political commitments, gave Russell the edge, I think. Additionally, he was plainly lovable; he did not shrink from changing his views after Einstein changed the world of physical reality---and very, very kind and generous to his friends.

I got the idea that the core ideas of many great thinkers are basically simple. His most important philosophical doctrine was based on the theory that the world of sense is a construction not an inference. It was originally developed by Professor A. N. Whitehead, and Russell acknowledged it. It is a philosophy by which physics is accepted as the final arbiter of reality, as constructed with percepts, or through experience. Physics constructs the world; it does not infer it from logical principles. Constructing means piecing together what are perceived that can be used to build a picture, an idea, of the nature of the physical world. Only physics does that. Thus Russell warned, "If there were any community which rejected the doctrines of modern physics, physicists employed by a hostile government would have no difficulty in exterminating it. The modern physicist, therefore, enjoys powers far exceeding those of the Inquisition in its palmist days, and it certainly behoves us to treat its pronouncements with awe. For my part, I have no doubt that, although progressive changes are to be expected in physics, the present doctrines are likely to be nearer the truth…Science is at no moment quite right, but it is seldom quite wrong, and has, as a rule, a better chance of being right than the theories of the unscientific. It is, therefore, rational to accept it hypothetically."[23]

In the work of any great thinker there is always a huge corpus of ideas, of course. I am here stressing only the most central or pivotal. Russell wrote about a hundred books on various topics in philosophy; but he made clear that what he valued most of all is what he called "unqualified acceptance of physics" concerning the nature of the external world. He built the philosophy of science almost single-handed, based on the central idea that the world of sense is a construction not an inference. Physics becomes our only reliable means to true knowledge of the external world if the world of sense is a construction; the study of that process of construction, which is physics allied to science in general, constituted, for Russell, the essence of the philosophy of the external world. It remains

[23] Russell, *My philosophical Development*, Ch.11.

the most rational philosophy of physical reality. In his book *Our Knowledge of the External World, as a Field for the Scientific Method in Philosophy*, Russell laid the foundation for the philosophy of science. It makes it all but impossible to propound metaphysics of impenetrable obscurity and vagueness in technical philosophy; this is not yet entirely impossible but hardly likely to gain reputable publishers' support.[24] Instead philosophers of science concentrate on efforts to make science understood and acceptable, as well as making suggestions for improvement in some theories. This is how the Oxford philosopher Herbert Dingle put it[25]: "One of the crying needs of our time is for a philosophy of science, i.e. and understanding of what science is and can be in relation to our fundamental needs and aspirations…Science itself is rapidly transforming at least the external patterns of our lives, but those who practice it cannot reflect adequately on what they are doing simply because they have no time. That is an independent inquiry, and a most urgent one."[26]

On the other side of the coin, concerning the attitude of philosophers, Bertrand Russell also had a nice word of advice for philosophers about science or how to treat science generally: "One very general conclusion to which I have been led by reading Professor Ryle's book ["The Concept of Mind"] is that philosophy cannot be fruitful if divorced from empirical science. And by this I do not mean that the

[24] Physics became the most important subject in the world, bar ethics; for the work of man and the quality of life in society are controlled by the ethical theories of good and evil; it is by ethics we know which aspects of physical knowledge to promote and disseminate, and which is dangerous, like the Atom Bomb, to be strictly controlled. You may have noticed that in our present obsession with the computer and the Internet, coupled with the politicians' inability to control them, media and marketing men are now dictating how we should live. In this case philosophers' ideas are powerless without political support. The results of the rule by media gurus are not pretty and may very soon become extremely dangerous, especially through the Internet.

[25] Those thinkers outside the philosophy of science (who are mostly sectarian) don't seem to deserve attention.

[26] By Professor Herbert Dingle, in a review article, TLS, Oct. 25th 1963.

philosopher should 'get up' some science as a holiday task. I mean something much more intimate: that his imagination should be impregnated with the scientific outlook and that he should feel that science has presented us with a new world, new concepts and new methods, not known in earlier times, but proved by experience to be fruitful where the older concepts and methods proved barren."[27] Russell also wrote a whole book about "The Scientific Outlook", which I think, should now be reissued to the general public---possibly free! This may bring a wry smile to the lips of sceptics, but we ought to realise that science can destroy the world, and at present it is going about it on the internet with assiduity. Calamity can happen through mistakes and accidents or by deliberate acts of horrendous perfidy on the internet. So many people are attracted to mass murder, mostly from religious, social, racial, political and financial motives. But even they are the least worrisome. The level of mental illness in the general population is astonishing; about one in four people are clinically insane, especially among populations of high density (the sprawling cities) and those in troubled spots in the ghettoes and areas of religious fanaticism. Yet the internet is worldwide. We have to be ware. The philosophers should make their voices heard. In the distant past philosophers cared little about the state of the world we live in. But Karl Marx won general applause when he said the whole point of philosophy is to change the world for the better. So Professor Dingle and Russell were right to counsel intimate scientific involvement.

In the meantime, we may care to note that the contest about strict rationality between mathematicians and philosophers has long ancestry, perhaps even before Plato. Following the work of Bertrand Russell and Professor A.N. Whitehead, both mathematicians, logicians and philosophers, particularly in the debate about physics and philosophy, at last the philosophers have won the accolade---chiefly because the Minkowski formula so adored by mathematicians has turned out to be a

[27] Bertrand Russell in My Philosophical Development, Ch. 18.

distortion of relativity and is leading physics and cosmology astray unnoticed. No philosophers even of the lower ranks will countenance the act of deliberately assigning imaginary quantities and properties to physical phenomena in any supposition, let alone a fundamental one as important as the theory of relativity. The whole debate centres on the work and attitudes of mathematicians. When they wrap up their arcane, almost religious, ideas in complex symbols that they interpret to suit their nostrums and resist all scrutiny in the name of counterintuitive formulas, it is difficult to see how philosophers could assist them. Philosophers can never think like mathematicians; hidden meanings are anathema to the very nature of their work. It has been said that for clear definitions one should go to the philosophers; more than that, thanks to Russell and Whitehead (and many other minor thinkers, of course), mankind has a philosophy, unlike the contradictory doctrines of mad metaphysicians, for the rational study of physical reality.

THREE

Plato versus Einstein

His contemporaries called Einstein philosopher-scientist, so I suppose it is acceptable to compare him to Plato, but not as a philosopher; we can compare them as to how they will influence future deliberations about nature. My prophesy is that one of the two is definitely going to be discarded in favour of the other. If it is correct that, since Plato, Western thought has all been just footnotes to his chief supposition that the world of sense is unreal, as seems generally accepted by now, then we can compare Einstein to him because it is quite possible that henceforth all Western thought should become just footnotes to his chief supposition which implies that the world of sense is a construction in which man is deeply involved so much so that he can cause its total destruction.

Presently the followers of Einstein would have no difficulty destroying the world, so common sense dictates that we choose to write footnotes to his theories rather than those of Plato. We are not here concerned so much with the theory of relativity as the quantum supposition. That is the shocking theory that the world of sense consists of quanta because all bulky matter can be dissolved down to so many bundles of quanta, the smallest bits of matter that can exist; radiation and energy also gravitate from quanta, yet we see only radiated energy not things: that is to say, to see by means of light may now be interpreted as seeing the lights of things only (I will presently give the authoritative scientific outline from some of the cleverest experts who have worked on the quantum theory.)

Presumably (if anything can be presume about the quantum theory) every school boy knows that the quantum theory was discovered by the German physicist Max Planck through his Blackbody experiments; but he found it so shocking that he and his researchers were still trying to think about what the discovery meant when Einstein wrote his paper, *On a Heuristic Point of View about the Creation and Conversion of Light*, announcing his light quanta hypothesis to the effect that light (or radiation)[28] is really a stream of particles called *quanta*. The very light by which we "think" (or have thought) since the days of Plato to be the agent of seeing bulky matter was also shown to be part of the material content of all matter; and soon the theory was confirmed with the photoelectric effect.

Naturally, it was the theory for which he was awarded his Nobel Prize for physics. But I believe Einstein was cheated; he deserved one Nobel (or a share of it) every year of his life from 1905. The theory totally destroyed any lingering credence in the Platonic theory of Forms. And so Plato lies there fatally wounded. It remains to bury him intellectually. There are practically no thinkers of note who believe that he can bounce back. Yet one of the most able disciples of his, writing his most famous footnote to the Platonic theory of Forms or Ideas, Bishop Berkeley, according to Bertrand Russell, "…advances valid arguments in favour of a certain important conclusion. He thinks he is proving that all reality is mental; what he is proving is that we perceive qualities, not things…" You will have to read Berkeley to know that his qualities were supposed to be those of the surfaces of things,

[28] One has got to be careful because the quantum theory is so strange, abstract and difficult that a single inappropriate word can vitiate a whole passage. In technical language it is easy to describe the quantum as the radiation of energy in the form of quanta, or the particles of light. The whole of the Berkeleyian theory of perception that the quantum theory has proved is implied in that one sentence. But in writing for the general reader such technical language cannot be relied on to convey the exact meaning intended.

meaning that we perceive only the surface qualities of things, not the things themselves physically.[29]

How could this be the hypothetical gun that blasted the irrepressible ghost of Plato to permanent oblivion (and good riddance), you may be tempted to ask. The simple answer is that we still see by means of light agency; but now we know that this light is a stream of individual particles flying off, or radiating from, the surfaces of things. As will be presently explained, to see things we have to absorb some of the surface radiation. So Plato is no longer relevant as his Idealism is permanently destroyed thus: in the days of Plato he conceived his notion to accord with how we saw (or still see) things by means of light. Some thinkers even believed that the light came from the eye to illuminate things, others believed otherwise; but whatever the basic supposition about the nature of light, apparently the idea is irrefutable, simply because without light nobody can see anything. It is the same today; without light we cannot see. But now we understand the composition of light differently, thanks to Einstein.

Hence the idea of seeing the images of things has been discarded, or must now be discarded from those archaic corners of die-hard Platonism. Images do exist; we can observe them in mirrors and ponds, of course; but we no longer accept that they enter the brain physically, or that they invoke mental images on the principles of the Platonic theory

[29] We do not even see images. The arrival on the eye simultaneously of different particles of different colours from any object is the very process of forming images, as chemical photography illustrates; but in perception it is the arrival of physical particles in inanimate associations of which they have no knowledge. They are each going its own way, and the chemical or physical processes they invoke or cause in the brain to give vision are also not organised: it just so happens that all the particles of light have one velocity, otherwise there could not be any images at all, not even on the photographic plate. That is, if the red, blue, green brown and yellow quanta from one object were to arrive on the eye or photographic plate at different times, images would not exist. They are each going its own way. The formation of images by quanta from objects is coincidental---or accidental, if you like. Man benefits from so many accidents in nature, that is one of them.

of Ideas. In the days of Plato the scientific nature (logical or physical composition) of light was unknown. Everybody was aware that without light man could not see things. The only explanation was, and in many respects still is, the Platonic theory of Forms with which he meant to solve the problems of both perception and universals; and he succeeded until the time of Einstein. That the general public still believe in the Platonic theory is due to the abstract and magically strange and inaccessible nature of the theory of quantum, and not least also because people normally leave science to the scientists, and the quantum theory is the most abstract of scientific ideas

However strange, in fact, the quantum theory gives amazingly simple interpretation of light. It is a beam of glowing particles; each has its own colour and glows with it. Every image is a composition of different-coloured quanta, each arriving at the eye by its own wavelength. The shock of the theory is due to the fact that the quanta are pieces of matter, the smallest bits that can exist. Light is radiation of energy---matter flying about in the smallest bits that can so fly about. Hence seeing is interpreted as absorption of quanta, of matter in their tiniest pieces. I can assure the reader that all this has been proved beyond doubt. So here are some reflections (as confirmation) from Dr. C.D. Ellis and Professor G.N. Lewis. These ideas come from the substance of three lectures on 'The atom of Light and the Atom of Electricity', delivered at the Royal Institution on February 25 and March 4th and 11th, 1926. Extracts of these lectures were published in NATURE No. 2956, Vol. 117, of 26th June, 1926, p 895-897, under the title "The Light Quantum Theory". I quote the passage directly relevant to the question of visual perception as I have been discussing: "It is a striking fact that while all the theories are directed towards explaining the propagation of light, one theory suggesting that it occurs in the form of waves, the other in the form of corpuscles, yet light has never been observed in empty space. It is quite impossible to observe light in the course of propagation; the only events that can ever be detected are the emission and absorption of light. Until there is some atom to absorb the radiation we must be unaware of its

existence. In other words, the difficulty of explaining the propagation of light may be because we are endeavouring to explain something about which we have no experimental evidence. It might be more correct to interpret the experimental facts quite directly and to say that one atom can transfer energy to another atom although they may be far apart, in a manner analogous to the transference of energy between two atoms which collide. Prof. Lewis says: 'I shall make the contrary assumption that an atom never emits light except to another atom', and that in this process, which may rather be called a transmission than an emission, the atom which loses energy and the atom which gains energy play co-ordinate and symmetrical parts." In plain language, the notion that light consists of quanta is beyond any shadow of doubt. Let me stress this for it is revolutionary: light consist of quanta; and we see nothing in this world except their radiated quanta. These quanta are the smallest bits of matter that can exist, at least in our part of the universe. The one completely inescapable fact is that we can only see things when there is light. The experts have discovered that this process of seeing is not one of observing images by means of light illumination because there is no such thing as light illumination in the universe. We now know that light does not passively *illuminate* objects or their images for our visual pleasure---light is absorbed on contact. As Neils Bohr put it: "From the physical standpoint, light may be defined as transmission of energy between material bodies at a distance."[30] So it means we absorb quanta to see the world. And if that is so, then we cannot escape the natural corollary that we see reality as plainly displayed by quanta before our eyes.

Many theories have been advanced as to how this is achieved, how we see the world through the mere absorption of quanta. The simplest theory is that the brain computes the images of things from the small amount of quanta that reach it from the light source. In this sense, and so long as we need light to see

[30] Neils Bohr, *Atomic Physics and Human Knowledge*, John Wiles & Sons, 1958.

things, the Platonic theory of Ideas or Forms is no longer tenable. The images of things appear to be woven by the quanta that constitute the light; light does not illuminate pre-existing images in the human cortex, for there is no illumination by light quanta---they do not illuminate anything; they interact with the atoms of things, as the experts have stated above. These are scientific facts as opposed to mere arm-chair philosophic or imaginative interpretation of the word. And since by their scientific theories physicists can destroy the world, it is sheer common sense to believe, accept, or obey their commands. Let us not make the mistake of speeding up our own destruction with the theories of thinkers who had no idea of the power of science over natural forces. These powers are not a lot as against the harsh material world; but for feeble man it provides both comfortable defences against destructive calamities, and threats of total destruction.

Given the situation as it now is, it is a safe bet that in future Western Thought will all become footnotes to Einstein, the master of the theory of quantum, and not to Plato, the man who said everything perceived in the physical world is just an Idea from God. And this is where the rational study of time is important; and yet again it was Einstein who began the process. If he had not described the Lorentz local time as ‘time, pure and simple’ space-time would have been regarded as an auxiliary mathematical curiosity so that, like Minkowski, time would be invoked with the square root of minus one, a mere mathematical technique. Yet it is important to explain time rationally otherwise it will become the last hiding place for God---that is to say, a mystery no one can explain except to attribute its existence to a Creator. For the truth is that Einstein *never* concerned himself with the question as to where time comes from, that is the reason he failed to notice that the Minkowski formula he praised implied the existence of cosmic or universal time, as it is invoked with mere mathematical symbols. All the suggestions in this book that, (1) time is a union between the sense of duration and external cycles; (2) that it passes by like the years, that is, in the form of a procession of its individual units; and (3) that the passage

of time is the same as its continuity, are all recent ideas---post Einstein. Additionally, they include the notion that time begins when we count units between points, the best examples of which are the passing years. *But units of what? The units between points show time going. In a real sense, time is nothing but the units of repetitive cycles---counted as years or whatever. Our time is based on the earth-year, as one unit of time. With mathematics and other features of the world, we are able to sub-divide the year down to the seconds and so forth*.

In any case, to return to the contrast between Plato and Einstein, with Einstein's light quanta hypothesis proved with the photoelectric effect,[31] we can assert confidently without fear of contradiction that the particles of light are also pieces of matter, indeed the smallest bits of matter that can exist. In fact light can tear off electrons from steel. So here we have the two most original thinkers in history facing each other. With Plato we learn that reality is a mirror, or a reflection of what is really in existence. Ultimately it implies that we never perceive reality raw. With Einstein we are taught that what we need to perceive the outside world, called light, consist of the smallest bits of matter that can exist. Both are mere suppositions, the reader might think. That would be a mistake. Plato can never be proved. Einstein, on the other hand, is proved whenever you put the light on to see things. So if the pre-Einstein period of human history was dominated by theoretical footnotes to Plato, then after Einstein all human thought will be dominated by the Einstein theory of the quantum. The simple reason is that with the theories of Einstein we have the instruments to end human life; therefore, as Bertrand Russell told us, if we want to continue enjoying life on this earth, then we are obliged to accord modern physics an unqualified acceptance. We may continue to study Plato as history. But we study Einstein for our future

[31] Of course, the photoelectric effect phenomenon was encountered first. Einstein provided the explanation with the theory that all matter is similarly packaged into so many quanta.

guidance. If science continues to dominate human life, as seems likely for the foreseeable future, there will come a time when theories describing the world of sense as unreal may have to be proscribed by law. That will be the time when religion will come in for proper critical scrutiny. We cannot have one world in which everything is scientific, while at the same time, religious leaders continue to preach that we must worship the totems of their own minds. The same technique used to promote religion can be used to abolish it. It can be spelt out as persistent harassment through indoctrination and Propaganda. It is true that, at present, some people seem unable to resist the urge to worship; but a vigorous propaganda, without force or violence as happened with Christianity, can change their minds. And life lived rationally will definitely be better, all round (in medicine, in economics and welfare, in the absence of wars, in social affairs and politics, in the control of the harsh realities of the physical world, etc.) than life lived for the glory of a mythical god.

These are just my own brief concluding remarks of a chapter that may be called, 'Science and Religion': Einstein versus Plato translates into science and religion, no doubt. For a serious study, Bertrand Russell wrote a whole book about "The Scientific Outlook", and the reader will do well to read it in all seriousness, hopefully it will never be out of print---it shouldn't be. For the sad situation is this: we are reaching to the moon through rational thought, known as science. But we are culturally, spiritually and mentally controlled by people who encourage us to commit acts of violence as the passport to Heaven. They ask us to prostrate our noble selves for a mythical God. They encourage wars between tribes, setting man against his fellow man----and all because they want to live like Princes in the name of God. They want us to respect, nay, worship them indirectly because they have knowledge from God; yet the truth is that they are all failures. A little school boy can use knowledge of science to humiliate all religious leaders; they are phoney. Indeed, many religious leaders amass wealth secretly. Some commit rape, theft and murder, if challenged, they are capable of plotting

assassinations. They have extensive knowledge of herbal and chemical poisons, and they use them against their critics, sceptics and unbelievers, or anybody who annoys them. In Africa and other backward places like the Caribbean and parts of Asia, who are consumed by religion, mostly fraudulent sects, they use these poisons to kill people and claim it is the power of God, the retributions of God against sinners, yet they are the real abominable sinners. Everything in every religion is the phoney work of evil men. What is presented as the word of God is nothing but the word of corrupt men. The point is, why should rational man accept this situation? Why should even major scientists worship? Plato bears most of the blame; but I hope it won't last long after Einstein. We often hear trumpeted by religious leaders, sheltered and safe from danger, that God planned man's life for strife and struggle, and that they are good for us. Peaceful life, we are told, comes a poor second in innovations and creativity to periods of strife: "In Italy for 30 years under the Borgias they had warfare, terror, murder bloodshed---they produced Michelangelo, Leonardo da Vinci and the Renaissance. In Switzerland they had brotherly love, 500 years of democracy and peace and what did they produce? The cuckoo clock". (Orson Wells, "The Third Man".) My answer is that those are precisely the pre-scientific periods and their associated styles of life we must try and leave behind. It couldn't happen in the scientific era. We don't go to the moon through prayers.

Unfortunately I have to report that the signs that Plato will be abandoned are not good. As recently as 1962, Professor William Kneal wrote authoritatively in a little book promoted widely that, "We must retain the Platonic notion of Mental events which are distinct from anything in the physical world and manifest a special kind of connectedness."[32] So in one sentence the whole of the work of Einstein (physically proved) has been condemned as inferior to the imaginary world of Plato.

[32] From Professor William Kneal, in his *On Having Mind*, Cambridge, 1962.

FOUR

What happened to time and physical reality in 1905?

(i) I now wish to consider one man's revolution that changed our conceptions of time and physical reality for ever in 1905. Originally the concept of space-time, as conceived by H.A.Lorentz and adopted and adapted by Einstein with his analysis of *order and simultaneity* for time in special relativity, was not put forward as a new theory of time. How crucial time is in human affairs is shown by the implications for physical reality generated by this debate. For 'local time' was, 'a mere mathematical auxiliary supposition', according to Lorentz who invented it to account for a time dilation that had suddenly emerged (to his surprise and shock) from his attempts to interpret the Michelson and Morley results; a problem Einstein later resolved logically with his new philosophy of physical reality known as 'The Theory of Frames'. And the mathematicians themselves have conceded that, by his theory of frames, "Einstein solved successively the problems of the Lorentz-Fitzgerald contraction, the dilation of time as a measure of moving clocks, the aberration of light, the Doppler Effect…"[33] Time dilation was solved in the sense that the dilated clock is in a different frame. To my way of thinking, it means time dilation is really only clock dilation---involving only one clock's performance, not those of all

[33] I repeat that many scientists continue to say religious things about time dilation. Religion among scientists is not helping the cause of making science predominant in human affairs. The logical explanation provided by Einstein is given in the Encyclopaedic Dictionary of Mathematics, published by the Mathematical Society of Japan. Ed. Kiyosi Ito. 2nd ed. Vol. II, MIT Press Cambridge, Mass and London.

clocks universally. Those writers who assert that time dilation is still a puzzle in science have never thought it necessary to define time after relativity. The real problem in the study of time is that we are never free of it, so that many people don't feel the need to define it---for it is always there in the clock. The question is how does it get there, that is, in the clock and also in the mind or in sense? Any attempt at a logical definition makes most theories of it untenable; then people would fall back on religion, saying something like, "Ah, we all know that time is always there". That is not a scientific explanation; only in the religions do people believe things without trying to examine their logical credentials.

However, later on, more than two years after Einstein's special theory of relativity, the Russo-German mathematician Herman Minkowski, claimed to have discovered the mathematical formula for making space-time (or local time) geometrical. In his 1907 Cologne Colloquium, *Raum und Zeit* (Space and Time) by which he launched his theory, he said: " The views of space and time which I wish to lay before you have sprung from the soil of experimental physics, and therein lies their strength. They are radical. Henceforth space by itself, and time by itself, are doomed to fade away into mere shadows, and only a kind of union of the two will preserve an independent reality".[34] A powerful statement supported only with his ict equation. The experimental physics mantra is exquisitely placed to appear most persuasive. Yet if time and space *are* (always) naturally linked, one and the same thing, as a unitary entity, how come they were separate before? There could never have been space by itself or time by itself. Since they were separate entities, no mathematics can alter physical reality to unite them into one entity (see App. II below). Mathematics cannot alter physical reality; it mirrors it. We have to forget about complex mathematics. The principle of equivalence in mathematics is easily demonstrated in an elementary fashion: we write 5-2 on paper. The answer should

[34] Herman Minkowski, *Phys. Zeitschr*. 10. 104 (1909); Ges. Abh. Vol.2. p431.

be three. No mathematics can make it four, because if we collect five pebbles and take two away the physical remainder will be just three. However complex, mathematical quantity cannot alter physical quantity, it must correspond to it exactly. This is reflected in mathematical statements. They are called 'equations', equating to something or other. All mathematical equations are logical statements showing that something is identical to another or other things: they are prescriptive, illustrative, matter-of-fact or tautological. Thus Minkowski wrote 's=ct…'[35], equating space to time by mathematical means. But since time and space were always two separate entities, ordinary school children could have told Minkowski that he could never make them into one entity with mathematics alone; that is why he had to rely on imaginary quantities which, unfortunately, vitiate his theory. Instinctively, the mathematicians should know of this principle of equivalence in mathematics, after all it is not a theory. It is practical common sense.[36] *In any equation the physical quantity must correspond with the mathematical quantity, and vice versa*.

Russell said space-time (in the Minkowski sense) means the materials found on the earth have been compounded in such a way as to be convenient for mathematicians. And Professor Eddington himself said it is fictitious but may be used, bearing in mind that it is nevertheless fictitious. "Mathematics was never one of Einstein's strongest subjects. If he had worked harder, he might have come up with his greatest theory a lot earlier..." , according to John Gribbin.[37] So we have one

[35] In brief it means space is equal to time.

[36] The principle is my own pet theory, and not very important. It merely means the equivalence of mathematical results or calculations and physical reality. You cannot put a school class of twenty in a class room with only ten desks, for instance. It becomes important when a theorist is proposing to alter physical reality with mathematics from one to two or three to four entities. Then we can invoke the principle and say no mathematics, as in the case of Minkowski, can violate the principle of equivalence of mathematics and physical reality.

[37] *New Scientist,* Op. Cit., p 6.

thinker (an authoritative one who confirmed the general theory of relativity) asserting positively that the Minkowski space-time where time is space and space is time, is fictitious. Then Russell, a philosopher, mathematician, and logician of incomparable genius, also saying the Minkowski theory is only for the convenience of mathematicians. Furthermore, a popular writer on science, and one of great merit, is accusing Einstein of mathematical ignorance for failing to render special relativity in geometry as Minkowski had done for him. This is a serious charge, and surely sacrilege. Apparently it has escaped some commentators that Albert Einstein knew exactly what he was doing and how to express it in mathematics, no more and no less. It is true that he later adopted the Minkowski formula, but he was literally coerced by mathematicians. Secondly, the Minkowski theory did not challenge Einstein's basic ideas. It was more like a philosophical interpretation, using bemusing mathematics, the basis of which was logically hollow. As it relates to time it worked very well, as I have said, because time is carried in the mind; we transfer our mental periodicities to other metrics.

The problem is that apart from violating the principle of the equivalence of mathematics and physical reality (where one thing cannot be two, or three things four), philosophically, also, it makes time universal again, as it can be invoked with mere symbols---not created locally for local purposes. Everybody was afraid to mention the word 'created'. *Yet local time can only be a local invention*. In the absence of a universal time, how do we get our local time? The philosophical intricacies frightened everybody, probably including Einstein himself. So Minkowski got away with it, because his new concept of time did not affect relativity in practice. However, philosophically the basic structure of physical reality was altered from one of the 3+1 continuum to one where, according to Minkowski, time is inherent in space or phenomena naturally and can be invoked with mathematics. With men like Bertrand Russell and A.N Whitehead around, it was soon pointed out that Minkowski relied on an imaginary time co-ordinate, therefore his formula was arbitrary and

untenable. Meanwhile, since mathematicians found the Minkowski formula easy to work with, because by a simple equation time was included in all phenomena, Professor Eddington himself said it may be used but it should not be forgotten that it is fictitious---in plain language 'not philosophically true of the world'. *Pure mathematicians are happy since they are always inventing their own worlds to concoct their theories and leave it to the applied mathematicians to find out whether they are true of the real world or not*.

So that is the situation still; it was unwise for Einstein to be interpreted by mathematicians in a manner that altered his basic philosophical view of physical reality—because he was correct. I mean to say the original Einstein idea was correct, as time cannot be made part of space because it is a product of space, and therefore a third entity in addition to space and points. However, for mathematicians, so long as only the philosophical view was affected, they thought it was all right to use the Minkowski theory. Well, I believe they were wrong.

The wisdom of a man like Einstein is not for ordinary mortals to challenge. He was too great for that. I don't think the general public do realise that, of all scientists and philosophers, Einstein alone was unique; his theories needed no help from anybody. (I maintain that Minkowski was an unfortunate distortion. But his theory is so sweet to mathematicians that they will never discard it.)

Nobody in history has been as clever in science as Einstein, except perhaps Aristotle. And he must have known that, too. Asked what he would do if tests proved his theory wrong, he replied with a religious joke that he would only feel sorry for 'The poor Lord', because the theory was correct. He knew that time is not part of space, because the basis from which he was thinking about time was the Lorentz local time idea. He said he was able to complete the theory of special relativity only after he gained the insight that the Lorentz local time is like every other time---i.e. locally created for your own local purposes. It follows that time is not universal. That idea made

time ‘non-cosmic’; and non-cosmic time cannot be naturally implied in all space. A great logically minded scientist like Einstein would not miss that obvious inference even with his eyes closed.

Besides, the Minkowski theory is false; being fictitious means it is not true. But the basic theory of Einstein was correct since time can only be added to phenomena in the 3+1 formula, and never as naturally implied in all space as Minkowski made it, *but only with his imaginary time co-ordinates*. When mathematicians and cosmologists assert that they can work perfectly well with the Minkowski theory, they mean to say that it is deductively correct, after *i (his imaginary quantity)* has been assumed to be correctly representing time---which is certainly not the case because it is imaginary; it represents imaginary time, otherwise scholars like Bertrand Russell and Professor Eddington would not have described it as arbitrary. Unfortunately, in theoretical physics alone such anomalies are pretty common. Hence the long debate about Springs and Super Springs suppositions. Because it is impossible to prove anything conclusively in theoretically physics, mathematicians can imagine qualities, quantities and properties and reason with them, sometimes correctly, sometimes wrongly. That is what happened in the eather debacle. They want to do the same thing with the special theory of relativity because of the Minkowski arbitrary assumptions, and so philosophers must protest.

Let me give my own opinion; after that the reader can judge as to which opinion may be regarded as acceptable. Einstein said again and again that he was just a physicist. Even when he turned down the Israeli offer to be their Head of State, he said it was because he considered politics as far more complicated than physics, leaving us in no doubt that physics was his main subject. But physics is a composite subject, consisting of insights about physical reality and their (possible) generalised mathematical expressions. Thus if you are teaching people that water consists of physical elements put together, you must be able to say (mathematically) what part of oxygen and what

part of hydrogen make up water. Once this is demonstrated, anybody anywhere on this planet can then go on to create water or use its chemical composition correctly. So that, for instance, you will not go and give somebody water if he or she cannot absorb oxygen, and so forth. Physics consists of insights about physical reality and their generalised expressions in mathematics. All discoveries in physical thought are (or have been invariably) conceptually physical; they are linguistic concepts of nature, or of reality in the external world; they have not been discovered by mathematical equations of nature---the physical concepts come first.

You can have the insights about physical reality (that is, for instance, that the universe is not one coherent body but a multitude of separate fragments, each with its own natural laws, which is the basic logical concept in special relativity. And you can have the insight that the curvature of space causes gravity, which is the basis of general relativity) without the fictitious mathematics to make it easy for mathematicians to understand.[38] Where were they when we needed the basic concepts? You can never have the mathematics without the ingenious physical insight in the first place. Everybody can understand these unique insights linguistically; but not very many of us can understand them as compounded for the benefit of mathematicians. Even then I do not accept that the Einstein theory of Frames and special relativity can be given comprehensible mathematical expression. It would be so complex and unwieldy---and of no used to anybody who deals in physical reality, electricians for instance. We are thankful to Einstein because we prefer his theories in linguistics. Even Bertrand Russell did not consider refuting Minkowski with mathematics. It is not possible because the deductions are

[38] By bringing in considerations of the Pythagorean Theorem, Minkowski thought it would be easy for any mathematician to understand. That may be so, but time is not geometrical. It is a concept we apply to nature for our convenience. You can only make it geometrical with arbitrary assumptions that are totally at variance with the true nature of time as experienced by all and sundry.

correct; the bone of contention is whether or not *i* is admissible in a theory of time. And since it is not admissible, it was enough for him (Russell) to point out that the theory is unacceptable because it is based on arbitrary assumptions. To be honest, if *i* is allowed, the Minkowski theory is correct, even beautiful. I have already conceded that point. I understand why mathematicians adore it. The problem is *i* cannot be acceptable in a theory of time that is proposing a union between space and time to constitute one entity. Secondly, the square root of minus one can only invoke the internal time-sense; the other half of time, the union between the internal time-sense and external cycles which makes it possible to mechanise time in the clock, is not taken into account in the square root of minus one; thirdly, time that includes external cycles is obtained from space and points, as the hybrid or offspring thereof. As such it is a separate entity from both the space and the points.

To my mind, therefore, the Minkowski attempt was not successful. But many scientist and mathematicians believe that it was 'highly' successful and has led to a new conception of physical reality with which they 'can do business'. Mathematicians are quite happy with the Minkowski formula; if they had experienced difficulties with it, it might have been easier to refute it. I suspect, however, that the mathematicians (in particular) adore it because it allows them to speculate 'religiously' about time travel, claiming that it is real. In most of their work pure mathematicians are free to invent imaginary quantities and numbers. And so the interpreters of general relativity make such mystery of time based on the Minkowski theory (that time and space constitute one entity), so much so that reality, they claim, was permanently altered the moment Minkowski announced his theory. *But he just said it*. He merely impudently asserted that from the date of his lecture space and time ceased to be separate entities; how very convenient to alter physical reality by just wishing it! And yet we are told by mathematicians that Minkowski is right. If that is how physical reality is altered, we could do so every day of the week. In fact, he was mistaken, and that is the problem

facing physics at present---although it would seem that nobody regards it as a problem. However, I will argue that it is a major problem since time involves the real nature of the quantum, as it is known as 'energy-second'. The energy is one thing; the second is quite another; but at the moment there is no logical definition of the second that makes it *a universal phenomenon*. So how can the quantum be a natural unit of energy?

There is a definite unit of time in the Planck Constant. Maybe it keeps changing as computers help to refine calculations; the last time I saw the figure it was strangely different from what it had been before. This element of time is a portion of the earth cycle we use and sub-divide for all our time, a miniscule amount of the unit that makes a second. But we have to remember that the second can be sub-divided more than a million times. So even if the amount of time needed for the quantum to materialise is changing, the fact that it is essential is beyond question, but whose time unit is it? Is it a universal unit of time valid throughout the cosmos?

Is there such a thing as a universal unit of time, and, if not, then are we to regard the quantum as a product of our own unique time, limited to our inertial frame, in accordance with the special theory of relativity? Otherwise can it be the same throughout the universe as it is known here by our sub-divisions of the earth-year? In the wise words of our most (the whole world's most) recent great philosopher, Lord Bertrand Russell of Great Britain, "It seems that the one all-embracing time is a construction, like the one all-embracing space. Physics itself has become conscious of this fact through the discussions connected with relativity."[39]

Time must be defined first. I define it as "using repetitive cycles (like the years) to sub-divide existence into 'Temporary Bus Stops' along a route---the journey of life". Since the external cycles we use for time are uniquely our own, how can

[39] Bertrand Russell, *Mysticism and Logic*, Allen & Unwin, 1917, Ch. Viii (x).

the periodicities they produce be replicated elsewhere in the universe? But, without that, how can the quantum be a natural unit of energy-second?

As mentioned above, Bertrand Russell described the Minkowski theory as based on 'arbitrary assumptions', since it is based entirely on imaginary time co-ordinates. Whatever the mathematicians say, the Minkowski ict equation relies on imaginary time co-ordinates---*where is the time of the negative quantity of i coming from in the absence of a universal time*? Thus Russell insisted that the derivation of 'interval' founded on the Minkowski ict equation must be clarified 'if interval is as fundamental as it appears to be in relativity'.[40] I believe Russell was absolutely right, although his criticism was ignored by the scientific establishment in mathematics and cosmology. The policing of original scientific ideas in the academic journals has for a very long time been the preserve of mathematicians, who apply ruthless mathematical methods to dismiss many contributions.

Judging from my own experience, I believe the scientists will object that Russell failed to refute Minkowski with mathematics. However, it must be realised that Russell was himself a great mathematician, a great logician and a great philosopher, and, as such, he could clearly see that the Minkowski mathematics is *correct, deductively*. That is the reason it seems to work for mathematicians and cosmologist. They want any formula that includes the time as an intrinsic part of space, other than the 3+1 system, whether that theory is true or not.[41] In the history of science, I know of no thinker

[40] *The Analysis of Matter*, By Bertrand Russell, Ch. XXXVIII. The concept of intervals is still there, and just as fundamental to relativity; even worse, it still rests on imaginary time co-ordinates. Scientists don't want to re-examine this, but they should. It is illogical. No amount of mathematics can ever disguise the illogical foundation of the Minkowski ict equation.

[41] It is strange. There is no reason for it. One has to think of religion or philosophy. Philosophically, the 3+1 formula made man part of the observed, since he has to add the time co-ordinate. This made physical reality not entirely objective; yet it does not matter, because whatever we do it is how man perceives the world (how it filters through his mind) that

adored by mathematicians more than Minkowski; they say he made Einstein's theory of relativity accessible. In fact, he distorted Einstein's notion of space-time. The logical defects in his system are so glaring sometimes I wonder if we are reading from the same text. How can mere imaginary time co-ordinates give time in actuality such as we have in the clock?

It can be said that Minkowski was right because there is always time "No matter where from". But the fact of the matter is what Minkowski (probably) didn't know, namely, that the seat of the sense of time is in the mind, in everybody's mind, as the sense of duration, or knowledge of things enduring, without which no memory is possible. *For this reason there is always awareness of time in the human mind.*

Hence the square root of minus, as time, will convince people; but that would be a universal time, which we now understand does not exist. Secondly, the word time is meaningless without adding "how much time". If people accept that *i* invokes time, they do so using the internal sense of duration, but that is not enough. *It is vague because you cannot tell how much time from that*. To have time that can be mechanise into the clock, the internal sense of time, as the sense of duration, has got to be linked to external cycles to establish the rates of time for any event. Time is always 'how much time'. Invoking the sense of duration alone is not enough for two reasons: first, because it is subjective, and, as such, is bound to vary with different people; and second, you cannot tell how much time by it.

You get the idea that something has endured; it takes time to endure. *But how much time? You can only know that by referring to external repetitive cycles in conjunction with the sense of duration. Duration alone is not time. But the need to use external cycles comes from the desire to know how long*

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can give any data for scientific purposes. The religious aspect can be considered in the same manner: that some people prefer to take time as 'given' with matter or space---given by whom? Of course, everybody knows the answer.

the sense of duration of anything or event lasts or lasted. This is the metaphysical, scientific, cultural and logical basis of time in the human mind. The idea of time as something enduring is thereby given external numerical quantity so as to be able to tell 'how much time' in mathematics that accords with the physical conditions of the world---like night and day, for instance---so that midnight refers to the middle of the night, and mid-day the middle of the day-light period. The metaphysics of having 'your own' time means every other 'Beings' in the universe will have their own unique system of time, or of *quantified time, since the periodicities fashioned from their physical reality will be different*. Thus the reader will realise that the question of time, as initiated by Einstein, is most profound---for having your own unique time means your mechanics will be different. So every 'Being' is unique; therefore we are on our own; our nature is most unlikely to be replicated (exactly) anywhere in the universe.

Let me give another example of how the sense of duration must be linked to external cycles or mechanisms to produce time for the clock: take for instance an alien from outer space. As a living 'Being' he would undoubtedly have the sense of duration in his mind; but when he looks at our clocks they will mean nothing to him because his sense of duration has not been linked to external cycles familiar to him. Even a school boy who has leant to read the clock would know about the seconds, minutes and hours; but the alien wouldn't be able to make sense of them. The internal time sense must be linked to external mechanisms to result in the creation of time for the clock. A fuller account of this is given below. Look at how instinctively children are able to understand time in the clock as it relates to the earth's cycles. We only teach them about the seconds and minutes and hours. We never have to teach them how they relate to the orbits of the sun. They will understand the clocks before reaching the stage where they can be taught about the earth's orbits of the sun in geography. And if they do not go on to study science, they may never understand the solar system and the intricacies of the earth's orbits of the sun.

Yet they will be wearing their wrist watches, and glad to get new ones for birthdays.

However there is a down side to this. Practically everybody believes in general or universal time; very few people, mostly in mathematics and philosophy, accept the Einstein notion of time, or have made any efforts to try and understand the Einstein theory. The chief reason is that learning how to read the clock, or how to tell the time, is taught without any explanation as to the nature of time. So people grow up assuming that time is always in existence and is everywhere the same as they find in all clocks---at home, school, work-place, and practically everywhere. This attitude has a very powerful influence on people's ideas about religion. They think they know that time is one thing that science cannot explain; and that it is mysterious, not created by man, always there, and everywhere the same.

But they are right. It illustrates the phenomenal importance of Albert Einstein in science and philosophy. Bertrand Russell got it absolutely right too, saying that space-time is the most important of all the theories of Einstein. Professor Eddington, too, said something like that. For, without Einstein's theory of time, nobody could have defined time so logically consistently in conjunction with physiology or psychology. I recommend to the reader the above definition of time as the most logical the human mind has been able to conceive and must be clearly understood to strip time of all mystery. Although it appears that whatever we do in rational thought, even when mathematics has been eliminated, time will still be mysterious to some people; the reason is that the logical explanation has got to be abstract, there is no other way. The majority of mankind will never be able to understand the logical explanation of time, and may have to take it on trust. But worse things are taken on trust than the logical explanation of time. At least it can show how time passes and seem continuous, or perpetually there.

Partly because of the reason give above, challenging Minkowski is difficult; it is also difficult because some people

believe in the vagueness of time, even prefer it, just to maintain the sense of mystery they harbour for time; that, of course, is how religious people prefer to discuss time no matter how the logicians and scientists and philosophers define it.[42] So Minkowski seemed to have invoked something religious in people because his theory can be used to argue for realms-of-fantasy phenomena, like time travel, that would enable scientists to meet their ancestors before they were born. I get the feeling, again and again, that many people would not like to believe that time is purely secular. It makes man entirely on his own without the possibility of metaphysical company; and in our private thoughts, nothing is more perplexing than the awareness of man's metaphysical loneliness; it is what makes everyone, in some degree, a philosopher or religious to the very end. It is the only reason philosophy is often regarded as part of religion, or vice versa.

Time is at the heart of all human mysteries; and the way we teach children to tell the time keeps the mystery alive. They are taught just to be able to tell the time, which makes them believe that it is naturally in existence and the same everywhere---as the clocks show the same time everywhere, with just minor variations. Time is partly responsible for the religious hold on people. Perpetuated as something of a mystery by the way we introduce children to it, time is the principal reason some people grow up deeply religious. Human beings want to feel that they have a special place in

[42] I have already given the logical grounds for rejecting the mysterious universal time. It may be helpful to repeat them here: the first is that time changes in different conditions, one example is time dilation. Also Einstein showed with his analysis of order and simultaneity that the changes in time are truly unaccountable except with the concept of real differences in time in different conditions; secondly, the Einstein theory of frames makes earth-time, using cycles known only on the earth, uniquely limited to the earth only; the third reason is the concept of local time. It is not so much that it is local. The real difference is that, as local time, it originated locally, the logical analysis of which process shows that it is derived from points as applied to the local space. The implication is that anybody anywhere can create his own unique time, using external cycles in conjunction with the sense of duration.

the scheme of things in the universe, and are not born to die like other animals, as A.J.P. Taylor put it: "with no more history as if they were cattle".[43] Science will never be as popular as the religions, principally because of the nature of time. It may not seem obvious, but time is feared by people, and they want to keep it so. Few people are interested in time's logical and scientific interpretations that strip it of the mystery in it that they adore, a feeling much like the human need for tragic stories, all of which reinforce the urge to worship. But, at last, there is hope. It is possible that as the rational Einstein notion of time eventually becomes well-known, the religious mystery surrounding time will evaporate but only in the very distant future, if man survives the subtle but debilitating psychological conflict between science and faith.

People want to worship, yet they are afraid that it makes them look stupid because of science. Thus the leader of a civilized country like Great Britain can say, deceptively, "we do not do religion" while in office, and rush to join the most medieval of churches as soon as he is out of office. It brings to mind the Lenin dictum that any cook can rule a big state; for in the same year as this happened, a survey found that people believe religion to be 'the new social evil'.[44]

The Cartoonists may enjoy the spectacle of a former ruler of Britain, who used to appoint the bishops of his own national church, going to humiliate himself before the Catholic Church, but it is no laughing matter. It reminds one of the late Secretary General of the UN, Dag Hammarskjold. After his death it came out that he had a religious shrine in his bedroom, where he (foolishly) used to go to pray to God for deliverance

[43] He wrote in the *Listener* in 1962: "Before the French Revolutions, history was just the story of what was happening to the people at the top, and the ordinary man and woman had no more history as if they were cattle."

[44] "A poll by the Joseph Rowntree Foundation uncovered a widespread belief that faith---not just in its extreme form--- was intolerant, irrational and used to justify persecution…" (The London *Sunday Times*, 20th April 2008, News, p.4).

in times of world crisis. Everywhere we get evidence that people do want to worship (yet they are afraid) due to lack of philosophic insights. Now historians may have to dig back in British history to see how many of the religious man's erratic decisions involving the deaths of thousands of innocent people were stealthily influenced by his medieval faith.

However, as a philosopher[45], we must concede that *what* Russell was concerned with was the logical foundation upon which the Minkowski supposition is based---not the deductions based on it. These are two different strands in epistemology: a fact and what it can be used for are two different things. Of course if the fact is false deductions based on it will be flawed.[46] The mathematicians do not see this happening to the Minkowski formula; unknown to them, it is because time is always known to everybody in the mind as the sense of duration; not as can be programmed into the clock, but only philosophers worry their heads about such trifles. See "The General Theory of Relativity" in *Russell's Analysis of Matter*. Normally I should be only too glad and ready to quote him for support; but there is a problem with Russell, too. It is the common problem with the Minkowski theory. Russell has contradicted his own objection to the Minkowski proposal, as he wrote on the basis *that* (or as if) the ict equation has already *linked* space to time in the manner he used the term 'space-time'. You have to look closely to notice the error. It makes space-time appear to be proved, an established fact.[47]

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[45] Specialists deal with problems in their individual fields. Philosophers consider the whole of human knowledge in theories of epistemology that must accord with ontology. For instance, in the present debate, I consider that the epistemology of time as space-time must conform to the ontology of the quantum as "energy second".

[46] It may take years, even centuries, yet by all means the truth will be out. I can predict that eventually the Minkowski theory, being fictitious, will cease to be mentioned in physics, especially once the main problems of time (passage and continuity) have been resolved.

[47] Professor Eddington did the same thing in his *Mathematical Theory of Relativity*, except that he was careful enough to warn mathematicians that the theory was fictitious and so those using it should bear that in mind. The

Let me try my best to explain what seems virtually inexplicable, or irrefutable, the reason mathematicians adore the Minkowski theory.

Russell was criticising the Minkowski theory, yet this is what he wrote (and how he put it implied acceptance of the logical basis of the Minkowski space-time concept as 'true')[48]: "Of all the ways of arranging the points of space-time in a four-dimensional continuum, there is only one that has physical significance…" This is completely objectionable and unacceptable as the basis for reasoning about physical reality. Russell is reasoning as if the four-dimensional continuum of space-time is proved, or is part of natural law. *Yet it is the same Minkowski ict equation by another name. Space-time in the Minkowski sense, together with the many different ways of expressing it (4-D Geometry, 4-Dimensional continuum, and so forth) is fictitious and therefore logically untenable*. Such a false notion has no place in physics. So, having described it as 'arbitrary', Russell should not have made the mistake of reasoning as if it is allowable as the basis for natural law whereby space and time are supposed to be one entity.[49]

Any time a writer mentions space-time it means he or she has *accepted* that the Minkowski ict equation has already linked space to time into one entity as part of natural law, or that it has shown that space and time constitute one entity---which is

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problem is they have never done so; space-time as a 4-D geometry making space and time into one entity still dominates cosmology---yet it is wrong.

[48] This is a common mistake. Russell himself said 'everybody knows that we should say space-time, where formerly we would say, time'. I will show later on in this book that, since the Minkowski theory is logically defective, and yet since all time is space-time in another sense, we can retain the term 'space-time' but redefine it to dispense with the imaginary elements in the Minkowski supposition. In essence, the whole purpose of this book is to help redefine space-time, not to reject it outright, so that we can go back to the original Einstein revolution about the concept of time from which, to get the four-dimensional continuum, we have to add time to space in the 3+1 formula.

[49] I know that scientists are having trouble with it but want to continue using it and keep quiet about it, but philosophically that amounts to a distortion of relativity.

not the case.[50] It is an arbitrary notion. It remains arbitrary so long as the proofs include 'thinkability' as Einstein himself put it (I will come to that presently). If one rejects thinkability as proof of the truth of the ict equation of space to time, then reasoning from 'Space-time', as Russell did, cannot be justified. I am not in any way questioning the use of imaginary quantities in other branches of mathematics. They have their valid uses in other areas; but in the study of time alone it is not correct to use it, because if you do you cannot explain where the imaginary time is coming form, or even how it materialises in physical reality, the material reality of time in the clock. On the other hand, one cannot rely on the internal time-sense, which is the sense of duration, because it is subjective and, as such, bound to be changeable.

We have long since abandoned the Pythagorean idea of mathematical entities having lives of their own; even then the imaginary quantities should have a route to normal life. You can imagine that they exist; but how do they burst into life to be utilized. If mathematicians will condescend to analyse the Minkowski ict equation, they will find that *i* cannot give ct--- where is the time coming from?[51] The *c* is always there; but

[50] The reader should know that the so-called complex mathematics used by Minkowski (whatever may be its actual intellectual merits), did not confirm the equation of space to time; it is not the section of his work that even proposed the link or union, as some writers maintain mistakenly. Hermann Minkowski used imaginary quantities in his ict equation to say space and time are inextricably unified into one entity. If we reject his formula because of the imaginary quantities, his whole beautiful mathematical edifice comes tumbling down irretrievably, like a house built on sand that floods have washed away. I repeat, time and space were made independent of each other in special relativity for this inertial frame, and they still remain separate. The Minkowski proposal would be the greatest mystery in human life if it were true. The mathematicians and cosmologists who accept it as true have sadly fallen in love with a beautiful myth.

[51] May I remind the reader that the suggestion that time is a union, instead, of the sense of duration and external cycles was not known in the days of Minkowski. Even if he had known about it and used it, he still couldn't have saved the imaginary co-ordinates in his formula.

how does the time come about to be read with the velocity of light?

The main problem is that, because of Einstein, the term ‘space-time’ is acceptable. Yet he used it for the special theory of relativity, where space is independent of time. Einstein never claimed that the unity of space and time was part of his ideas, and I wonder how he managed to live with it. All he did was to point out that space and time are not absolute but dynamic. It was Minkowski who used it (that is, the space-time concept) as meaning that space is *not* independent of time, or time of space, and that the two are inextricably linked into one entity. But it is unacceptable that such a major shift in our concepts of physical reality should be conjured by means of imaginary quantities. Sadly, once cosmologists and mathematicians fell in love with the Minkowski formula, and since they do most of the policing over new ideas for the academic journals, they have ensured that everybody uses the term ‘space-time’ to mean that space and time are one and the same thing. One wonders as to what mathematicians made of the earnest caveat by the great mathematician and astronomer, Professor Sir Arthur Eddington. There is absolutely no natural or artificial mechanism for joining space and time into one entity. Minkowski achieved his results with unacceptable quantities, thus making his theory logically flawed and unacceptable.

Thus Russell’s condemnation of Minkowski could be ignored by mathematicians, since he was also using the Minkowski space-time concept. What they wanted was that ict is true; and they get that satisfaction once the term ‘space-time’ is employed, as Russell has done; the rest is a matter of negotiable deductions. Mathematicians create their own properties (as required) to suit their nostrums. That is why they are *still* happy with Minkowski. Quite honestly, the Minkowski mystique, or even magical spell on mathematicians, is very difficult to dispel. The reason is this: because of Einstein (I repeat) everybody *must* use the term ‘space-time’, as Russell has said, ‘where formerly we would

say time'. Unfortunately, it implies a union between space and time to make them into one entity---but in physical reality that is not the case, simply because Minkowski relied on imaginary quantities, as mathematicians tend to do, except that in the case of time imaginary time will not do. Otherwise where is the time coming from? Or how does it materialise to be used? Time is time in the clock or it is not time, provided it is realised that there are many types of clocks. No clock from which you can read the time with *c* can be imaginary; yet *c* is central to the Minkowski ict equation.

(ii) We will have to retain the term 'space-time', but only as meaning that time is derived from space with points (you cannot have time without space), thus making it the time of your local space---hence 'local time'. However, I would add that this process of having time is sensible only because of the sense of duration we all carry with us in the mind. It is rather from a union of the sense of duration (as the internal sense of time) and external features of the world (or mathematics) we get time in the clock. The mathematics tends to make all time discrete, hence time units. The earth-year is one such unit; so are all other units of time derived from the year with points, or mathematics. The corollary is that time is known and used in units only----it is always 'how much time'; it does not make sense to just mention time.

So there is still a problem regarding the logical foundation of the Minkowski proposal. That deductions based on it are logically sound is quite a different matter.[52] For instance, you

[52] I am deliberately going over these points several times and in different ways for a purpose, namely, because mathematicians are clever thinkers not easy to convince, and worse, they believe absolutely in Minkowski! Even Professor A.N. Whitehead, philosopher, logicians of genius and mathematician, while condemning the Minkowski theory, nevertheless stated that we owe relativity to Einstein and Minkowski in the Introduction to his book. I put that down to the fact that, at the time, when Einstein was alive, everybody was afraid to criticise Minkowski---such that Eddington could say that his formula was arbitrary, and yet 'we shall use it'! The reason, I fear, is that if he failed to add this approval, thousands of mathematicians would have descended on him asking what else was there

could talk logically about trees as they are, provided you could convince everybody that they are pushed up by the 'hand of god'. Otherwise you will have to provide evidence of logical causality, that is to say, what it is that makes trees as they are; and that is the science of botany, or plant physiology to be exact. It gives knowledge of why trees are as they are. In the case of the Minkowski attempt to alter physical reality through his concept of space-time, his supposition is based on imaginary time co-ordinates. Naturally, the logician in Russell would call it 'arbitrary assumption'. Time and space were separate entities before Minkowski. The notion that they constitute a unitary phenomenon carries with it a very serious alteration of physical reality. Russell's objection was that such a serious philosophical enterprise cannot rely on arbitrary assumptions. It should never be left to mathematicians to decide the nature of reality. Like Pythagoras, they can never resist the temptation to include imaginary elements in it. The fault is in the nature of the subject---purely speculative as to why the physical world is what it is, and a lot of imagination goes into the process, most of it unavoidably idiosyncratic. Presumably that was why Plato conceived his simile of the cave idea. As a mathematically-minded thinker (and a great philosopher) he must have realised that he was required to determine the nature of physical reality, yet he was a mere human being, and a microscopic dot in the vastness of nature: therefore he conceived the notion that man is like cave dwellers who mistake the shadows on their wall of what was outside for reality, or real physical entities. How important was his observation is shown by the present world of relativistic quantum.

By its own inherent nature, space-time (in either the Minkowski theory or in the sense I am proposing), describes a

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to use, *for otherwise relativity is not entirely scientific*. It isn't, to be frank. There is a large chunk of the philosophy of time in it, however it is conceived. That's the important thing. It means reality was wrongly conceived before Einstein, because there is another large chunk of the observer in it because of time; but it is all we can ever know of reality, a la, the Platonic simile of the cave.

clearly discernible philosophical interpretation of existence. In my theory of space-time as meaning time and space are independent of each other, we get one kind of interpretation of reality if we reason thus: Space-time began life as the time of your locality, as it was called ‘local time’. Einstein made no changes in the Lorentz supposition. There was nothing to change, anyway. Lorentz had found that time by a moving clock runs slower. He was at a loss to know what it might imply, and called it an auxiliary mathematical quantity, not very important. Certainly he thought it was aberrant, and labelled it local time, the time for your locality; or a time invented locally for a specific purpose, not the real time of familiar acquaintance; and therefore nothing to worry about. He left it at that without further inquiry. In the hands of Einstein, however, it became the time for our local planet, our inertial body; and made it absolutely clear in the June Paper that there are as many times as there are inertial bodies. It is a philosophy, a new one that time does not run all through the universe and the same everywhere, so that a second here is like any other second anywhere else. This, by the way, is what makes the Minkowski intervention philosophically interesting, particularly because it is false---an underhand way to redeem religion, perhaps. The reason is this: In the 3+1 formula man adds the time to phenomena, or space. So if he creates the time as well, as his own ‘local time’, all religion is undermined metaphysically, a very serious state of affairs for mankind. It means intellectually religion was dead. Better to make the time an inherent part of space to restore the religious connotation of time---very clever.

It is all right to call this new time the time for our inertial frame, but where does it come from? We now think it derives from points as applied to space, any space at all, and that, as such, it is a union between duration and repetitive cycles. The experiment to prove this can be done by anybody using an ordinary plain sheet of paper. You put a series of points down, and move from point to point while reading the clock; time will be going as you do so. It makes time ‘relation between points’. At once space-time in this sense is discrete; it cannot

be anything else, being the product of points. It also has clearly traceable origins---not from outer space, but from our own space. Sentience is required, because somebody must be there to count the orbits of the sun by the earth as years or there will be no years and no seconds that are derived with points from the earth-year, and beyond which the concept of time has no cultural meaning. We can all feel the passage of age, and motion, which form the bedrock of quantified time; but culturally only quantified time is recognised in logic.

Thus space-time in either sense can be seen as artificial creation of man, with the major difference that in one theory it is the sense of duration we use external cycles to punctuate, thus making time a union between the sense of duration and external cycles, not a union between space and time. Otherwise critics would be forgiven for asking 'where is the time before it is unified with space'?[53] Mathematicians who accept the Minkowski theory have failed to ask this question because it will falsify the theory they so deeply adore. Yet the truth is that it is the union between external cycles and the sense of duration that give us time for the clock. In any case, presently time is not seen as a natural phenomenon. The existence of space is natural, but using points to create time units out of the fabric of space requires sentience. There is no time on the moon, for instance. There is only bland existence there. Also, time is seen as something based on 'Being', not that 'Beings' live on 'a given time', as primitive man supposed.[54] Otherwise where is the time? It does not come to exist until sentient beings create it as relation between points--

[53] The cardinal rule in the concept of local time, as space-time, is that you get the time from your own local space---but how? The only logical method is the one given by Bertrand Russell, namely as 'relation between points'.

[54] And it seems that modern man had no clear ideas about time; so he took over the primitive concepts about it from his ancestors---until Einstein tried to define it logically and failed. What he found was not the general time of the cosmos expected, but time as essentially your own local thing. So time was changed, or differently conceived for the first in human history by Einstein.

-until then, there is only bland existence. This was a great philosophical revolution, one that we owe to Einstein and Lorentz. It is nothing like the revolution that mathematicians think Minkowski introduced with his formula. That is regarded as logically untenable. Yet this is a decision about ultimate reality; any kind of mystical or illogical ideas are not admissible---otherwise we are doomed!

Yet still, mathematicians insist that the Minkowski theory is one that they are comfortable with, or find comfortable; unfortunately that is not the critical evidence (the acid test) that natural law requires. For example, in one exchange with mathematicians I was told quite seriously by a major Journal referee that the Minkowski theory of space-time "…is straightforward."[55] But he just stated this; that does not make the theory logically correct. However he went on: "Because S-T intervals are universal (i.e. preserved for all inertial frames)[56] the Minkowski 4-D geometry is a perfectly objective way of describing the S-T relations between events. The role of *i* here is just to make the metric come out right, and in no way undermines the Minkowski view of relativistic space-time." Yet, as in the reference to the nature or existence of trees above, you can say this only if you don't have to bother with explanations as to the logical causes for the existence of trees. If *i* is used logically correctly by Minkowski, then it implies that its imaginary nature must be ignored as if it were an edict of Deity. But we can't do that in science, can we? What Russell was worried about is this: can we do that in science? In technical subjects like chemistry, for instance, if you require a compound as catalyst but haven't got it, can you proceed on the assumption that imaginary quantities will make your chemical creation nevertheless 'come out right'?---in

[55] I sometimes get correspondence from mathematicians. One of them told me recently that Einstein achieved nothing of note, and that the main work was done by Hermann Minkowski, which reminded me that some wars are justified!

[56] Preserved by whom?

imagination, maybe; in reality, certainly not.[57] In other words, according to this mathematician, the imaginary time co-ordinates of Herman Minkowski will ***change*** the physical nature of the metric to make it come out right to suit the Minkowski theory that time and space constitute one entity. Is that logical thought? Even counterintuitive mathematics should obey the rules of logical validity.

(iii) Another mathematician argued that everything in general relativity is based on the ds^2 formula for space and, because of Minkowski, time is implied in all space. This is an example of formulaic mathematics leading to bizarre suppositions. Of course it is true that general relativity is based on then ds^2 formula for space. So the critic is not wrong; for as far as he was concerned, as a mathematician, he has learnt that the Minkowski space, as space-time, carries time with it inherently, indeed inextricably, therefore all space, even in the general relativity metric, is impregnated with time. We can object only on the premise that all space is not Minkowski space-time for the simple reason that the Minkowski space was a mere supposition based on his imaginary time---and imaginary time as per the square root of minus one, *being imaginar*y, obviously has no physical existence. Let me stress again and again that using the imaginary time to solve the problem of time was obviously illogical. What is painful is that even Professor Eddington insisted that it should be used.[58]

(iv) The Minkowski theory can be used because the mathematical deductions once *i* is allowed, are consistently correct; the debate is about the logical foundation upon which it is based---as the Journal Referee put it, the point is the 'role of *i*'. The whole argument centres on the role of i, and he

[57] That is the reason I call the Minkowski theory "Dream Physics". Only in dream can we make time an inherent part, rather than the offspring, of space.

[58] What sort of physical reality is this going to give us? It will be a false reality. The past hundred years since Minkowski have been wasted on a theory that has no logical validity. I know, of course, that it will be said that even Einstein accepted it. The answer to that is this: Einstein never claimed to be infallible; and, in any case, at first he rejected it.

implied that it did not matter---only there to make things turn out right! The magical wand at the heart of relativity. However, Einstein himself was blameless. We must always remember that at first he moaned quite explicitly that mathematicians had invaded his theory so that he could not even understand it any more, describing their efforts as "superfluous learnedness". But he failed to stick to his logical instincts about Minkowski and, I presume, allowed himself to be coerced by mathematicians in return for support for his ideas.

In his popular book about his theory, called RELATIVITY, Einstein was generous enough to attempt a logical proof of the Minkowski *i* as the basis of space-time, and therefore of time in general. Giving the natural process whereby space becomes time, or becomes synonymous with time, or is equated to time, he committed the error of stating that the proof would be as 'realised' or at least was 'thinkable'. Here is the passage from his book: "…we must replace the usual time co-ordinate *t* by an imaginary magnitude $\sqrt{\ }$ --1.ct[59] proportional to it. Under these conditions, the natural laws satisfying the demands of the (special) theory of relativity assume mathematical forms, in which the time co-ordinate plays exactly the same role as the three space co-ordinates."[60] Yes indeed they do. No doubt about it. The mathematical deductions, once *i* is allowed, are flawless, otherwise nobody could have persuaded Einstein to put his name to it. The problem is that equating space to time in this manner is illogical---there is no proof. There is no logical mechanism for linking space to time. You have got to get the time in the first place; but under the original Einstein notion of time as 'local time', the space is what we use to get the time. We cannot have time without space. So how do you link it to space again? The time should come first before there can be any attempt to link it to space. Yet the time is not there.

[59] This is known as the Minkowski ict equation because another name for the square root of minus one is *i*.

[60] *Relativity* By Albert Einstein, reissued in Routledge Classics, 2001, London and New York, sect. 17.

It is merely assumed on the strength of the imaginary time co-ordinates.[61]

The issue is straightforward. We need space to create time; so to say time is equated to space does not make sense---since you have to have the time in hand before you could link it to space; but you cannot have the time in hand because you are going to use the same space to create it in the first place. The reader should know that it is very easy to refute Minkowski by pointing out that imaginary factors are not admissible in the study of time. The point is, all the mathematicians who adore Minkowski know that. Thus we have to resort to alternative methods and arguments, or several of them, including repetitions and emphasis. Propaganda is out because this is physical reality; everything must be strictly logical and objective.

An attempt to explain the logic of how space is equated to time (how time and space are unified into one entity by Minkowski) gets dear old Einstein into difficulties, as he used the term 'thinkable' as part of the Minkowski mathematical technique. Yet he has never been challenge. It is not common to find criticisms of Einstein. Indeed, if he had not put his name to his supposition Minkowski would have got a roasting from mathematicians. So the notion that space can be equated to time on the proof of thinkability continues to rule in mathematical physics. Thinkability is all the logical evidence advanced for the existence of space-time as 4-Dimensional metric in physical theory.

[61] To link two things both should be present. We know the space is there but not the time. It is merely assumed that *i* will bring it, but we are not told as to how that was (or is) to be achieved. And since the time is not there how could it be linked to space? We are just told that *i* means space is time and time is space. Still, it is claimed that it works. Well maybe reasoning from this basis can produce some credible mathematics; but the foundation is logically hollow. You just cannot change physical reality from the attested 3+1 continuum to one of 4-Dimensional geometry with this kind of sloppy thinking.

Philosophically this is completely unacceptable. I should have thought the condemnation from Russell, and even Professors Whitehead and Eddington would be enough; but apparently they have had no effect. Cosmologists are continuing to discuss matters from the point of view of the 4-D geometry of Herman Minkowski, by which time travel is feasible; you can travel backwards and forwards indefinitely; space-time is infinite in its timelike directions; time dilation is still a mystery, thus making time appear to be universal because of the uses of *i* in the studies of time, and so forth. It is all very frustrating, especially when the writers of such hollow ideas can sit in judgement of any critical discourses, and ensure that contrary ideas do not see the light of day, let alone discussed impartially; and so advancement is stalled without anybody noticing that there is anything amiss.

(v) However, before we go on, let me quote Einstein again in his own words since this matter is crucial in the attempt to infer completely altered physical reality from the supposition of Herman Minkowski: "…the world of physical phenomena which was briefly called 'world' by Minkowski is naturally four dimensional in the space-time sense. For it is composed of individual events each of which is described by four numbers, namely, three space co-ordinates x,y,z and a time co-ordinate, the time value t. The 'world' is in this sense also a continuum; for to every event there are as many 'neighbouring' events (realised or at least *thinkable*) as we care to choose…" (My italics.)[62] So there we have it. The logical foundation of the 4-Dimensional metric of space-time is thinkability. By this technique Minkowski is said permanently to have altered physical reality to one of four-dimensions, being the three space co-ordinates plus time, and therefore space and time constitute one entity. Never mind that Bertrand Russell called it arbitrary. In fact, he was not the only eminent thinker to describe it so. Professor Eddington was emphatic, as already mentioned, he said: "…we shall continue to employ it; but we must endeavour not to lose sight of its

[62] Albert Einstein, Ibid, p.57.

fictitious and arbitrary nature." Never mind, also, that Professor A. N. Whitehead said "The heterogeneity of time from space arises from the difference in character of passage in time from that of passage in space. Passage is the same as significance, and by significance I mean that quality of an event which arises from its spatio-temporal relationship to other events."[63] In ordinary language, if we write $s^2 = c^2 t^2$---x^2—y^2---z^{264} on paper and watch the clock ticking seconds away one by one continuously, we will realise that there is no logical connection between the formula "s=ct …" on paper and time's passage in nature, or physical reality. Whitehead is saying space and time pass through nature as separate entities, not as one phenomenon. That was an adequate refutation of the Minkowski theory, but ignored.

[63] Professor A. N. Whitehead, *The Principle of Relativity*, Cambridge 1922, Ch. IV. I would advise that careful note be taken of how Professor Whitehead defined the term 'significance'.

[64] This is the basic formula for the Minkowski space-time metric following from the 'presumed' linkage of space to time by the ict equation.

FIVE

Relative realities[65]

I come now to the consideration of what may be called 'relative realities' under the Einstein theory of relativity. What I mean by this short phrase is the kind of reality you get by the theory of frames; the reality by your frame as opposed to the reality by another frame, for the conditions of existence in each frame is different from those of any other frame. In this sense Einstein changed physical reality in human conceptions in more ways than we realise. I confess that this may be controversial. It is a phrase I coined recently, and so must accept the responsibility for defining it. Should it fail to carry conviction, nothing will be lost; we shall just throw it away, but I doubt it. This is one way of answering the question as to whether our natural physical laws on this planet are replicated throughout the universe. I don't think they are, not exactly, because 'existence' , however it is defined, operates by a unique set of postulates, frame by frame.

From my point of view, however, it is the correct philosophical interpretation of the theory of frames; it means reality is related to your particular frame; that something (a condition, a life, phenomenon, an event, etc.) is what it is in its own metric---i.e. sustainable, congenial, workable, hostile and so forth, but only as related to its own frame. And I am suggesting that the theory of special relativity is better understood in terms of the fragmentations in nature, each of

[65] I agree with Professor A. N. Whitehead about process and reality. I think it is the same thing as relative realities. The idea that the process may be regarded as the act of relating to the cosmos makes sense, since the observer is part of that which is observed; in the same way the processing is related to the observer as his or her idea of reality.

which is different from the other, or all the others. The theory of frames is the logical justification for the Einstein theory of special relativity; in any case it is the supposition by which he resolved most of the outstanding problems of physics at the time. We have no reason to doubt its logical validity, after it has received such a resounding confirmation. Bertrand Russell always maintained that the Einstein theory is a logically deductive system; what this means is that all the many parts of the theory fit together logically smoothly like a jigsaw puzzle. And it is based on a unique brainwave of an idea. This brainwave, it should be emphasised strongly, is not like any other original scientific notion. It goes deeper than that. It is the foundation (the framework) from which scientific principles are deduced. The pivotal idea by which other thinkers can sharpen their wits, or display their cleverness. From the ingenious supposition that the universe is not one coherent body but consists of a multitude of fragments, we get the science to explain time dilation---which, it must be noted, is a physical reality; it is something that actually occurs in nature, but can be interpreted only with the theory of frames. The same thing applies to the aberration of light, the Doppler Effect, and the Fresnel's dragging coefficient.

Of course, this book is entirely devoted to a discussion of time; and so I must point out that by the principle of relative realities, earth time cannot be applied to general relativity if we are serious. It is a different frame. Either we forget about time in general relativity altogether, or we should approach it with earth time erased from our minds.[66] That will be a good test, the test of straining to discover how to have time in a general relativity metric. At present I think deliberations in general relativity are distorted by the use of earth time instinctively, as cosmologists tend to do. On the other hand, of course, it has to be acknowledged that they have to have time; if they cannot use earth time then the metric of general

[66] I doubt that we can amend earth time with mathematics to make it pertinent to the metric of general relativity—or to all conceivable metrics in existence.

relativity cannot be properly studied, and should be left alone. I can never be convinced that the study of general relativity can have beneficial influence on human affairs. The nearest star is so far away it can hardly have much influenced on the conditions of life on earth. The cosmologists using the Minkowski formula of 4-D geometry to study the metric of general relativity must be strongly advised that they are distorting Einstein's theory of relativity, special and general: special, because they are using special relativity time to apply to a completely different frame for which it not suitable; and general, because they are wrongly attributing strange and inapplicable 4-D geometry to it, leading to bizarre inferences to which any inhabitants of that metric, if he is not a mathematician, should take exception. Take, for instance, the notion of curved space-time. We are told that, even though the Minkowski formula is arbitrary and untrue, but because of it, time and space constitute one entity; therefore as space curves in the continually accelerating metric of general relativity, time curves with it to no conceivable end---leading to a situation when time will curve infinitely back to the time before the birth of one's grand parents. This is Pythagorean mysticism. It accepts that death is not the end; there are other worlds in which the spirits of people are always circulating after death. But is this the kind of logical thought with which to honour the memory of Albert Einstein?

SIX

Duration and time

There is no doubt that external reckoning of time is linked to something in the mind. It is the sense of things lingering in the mind as part of memory. Time is an external device to let us know 'how long' they linger; how many cycles before the lingering image goes away. You cannot determine that from the experience itself; external cycles are required. A useful example is the timing switch we have in our homes. The image that is lingering to be used for time (or for timing) is the light; the timing device shows how long it was there. It is precisely the way we use external cycles in conjunction with duration in the mind to get the temporal rates for anything. It gives the number of cycles. But in the case of the earth-time we have divided the earth cycle down to the seconds; so any unit of time will do, understood as part of the earth cycle. For this reason time always exists in the mind. The external cycles are deliberately chosen to record how many cycles equal any event.

To illustrate what I mean, let us suppose that we employ a schoolboy to go round a Cathedral to give us units of time similar to the orbits of the sun giving us the years. We choose the Cathedral as providing the required unit; otherwise if he went round a small hut his cycles would be too numerous to count. For the cycles must be recorded in the mind and related to the event, say, ageing---or any other natural process and events.[67] Ten cycles of the Cathedral means you are aged ten

[67] The mind is familiar with points-divisions of reality, or space, because the sense of duration uses points---from beginning to the end of any events is duration.

years; it is not exactly, but, in principle, it is the same as the years, only shorter; for the term 'year' can be applied to any cycle. The rates are then used as the rates of the duration of events, i.e. the number of cycles a certain event lasted, and so forth, which we call time. Thus the seat of time is in the mind; the repetitive cycles are the rates of the passage of the time felt mentally as associated with certain events and processes. The passage of time can be clearly seen as occurring through the procession of time in units. To get more years the year must be repeated; as it is repeated time is passing for the year encapsulates all other units of time down to the second. More years means time is passing, all the way to the millennia, but there is only one year in nature, as one orbit of the sun. *Thus the year cannot be seen as a natural unit of time, but rather the human unit of time---and, if so, then natural time does not exist.* Kurt Gödel missed this simple insight and therefore made his thesis on Einstein's time unnecessarily complex. The unit (or moment, as Professor Whitehead expressed it), is the time---there is no time outside the earth-year unit of time---but the unit is our own creation.

About the notion of measuring time, it is necessary to say something because practically every body uses the word 'measure' in his or her discussions of time---particularly the scientists. But I try to avoid using 'measure' in the debate about time. My reason is this: when time was assumed to be universal and sort of running all through the universe and the same everywhere, the theory was that we used our peculiar mathematics to *measure* it in our own convenient units. The reason is not too difficult to imagine. It is obviously easy to think of time as existing everywhere and we measure our version with the sort of mathematics we have invented. On this interpretation there can be several modes of measurement.[68] We can even have atomic time, where atoms

[68] Time for every corner of the universe was implied; they only measure it in their own fashion. This is an interesting point. Let me explain: In itself, this idea conceals the seeds for denying that time units are universally applicable, so that the second is the same everywhere, since people

can measure time with the finest or smallest unit of measurement. Note that an atomic time is time that is measured with an atomic particle, which, therefore, must be very small indeed. Implied in the idea of measuring time is the concept of universal time. Then came the Einstein theory that time is rather created by individual bodies in the universe as their own local times, called 'space-time'. Thus Bertrand Russell said universal time is abolished. These are some of the bare facts about time which most philosophers of science, scientists, and rational people, after Einstein, will accept without much argument.

Yet people think that the very fact that we can measure time with an atom means time exists and that we merely measure our versions of it. Every statement about time still now implies that we measure our time. The truth is that atomic time is related to the second (a sub-unit of the earth-year), otherwise it does not make sense. No time unit will make sense unless it is related to the year or any of its sub-units. It is true that man is free to employ another regular cycles in place of the earth-year; but as we have not yet done so, the year is the beginning and end of time for man. Otherwise time would exist in the mind all right as the sense of duration, but there would be no units of time as we have now with the earth-year, by using the year and its subdivisions.

Of course, in the absence of a universal time of which we measure our own units, we have to find (1), how our own time begins, or began, to satisfy people that time is not measured from the cosmos; secondly (2) we have to establish how we get the differentials (or fractions) in time (or the time units from the year to the seconds, and the cesium units, and so forth.) The answer to (1) is that we use points to divide space to get 'relation or intervals between points', which translates into *time in units, or time units*. So that how it is obtained answers the question as to why and how we get time (already)

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elsewhere would measure it differently. Yet, at the same time, it could be used to confirm universal time with the argument that aliens just happen to measure their own versions differently.

in mathematical units, if it is not deliberately measured in such units. There is a basic question of the metaphysics of time here. The idea that it is measured from nature implies the existence of a universal time---yet that has been shown to be logically untenable. But if we accept that time, as space-time, or your own local time, is created with points, then, obviously, the time comes (already) in units, being the product of points. In other words, time is seen as the product of points as applied to space, any space at all. This is the answer to 2 above. Sentience is required to sub-divide the year with points into the fractions of time we use.

I believe that, whether he was aware or not, the sense of duration in the mind is the sense of time Minkowski relied on or exploited, instinctively (but imperfectly, as he left out its union with external cycles)[69]; otherwise, in the absence of a universal time, the question where the time or sense of time invoked by *i* comes from is left unanswered; and without answering that question the theory is intellectually barren despite the complex mathematics he used.[70] I am surprised that without answering this question the Minkowski proposal carried conviction for some thinkers. It is true that it sounds religious, but then religion is not entirely without merit. In

[69] The word time means a union between the sense of duration and external cycles. The word duration means the sense of things enduring in the mind only. It is not time on its own; but it will eventually become time after its union with external cycles. There is no other way that time, as a beam of periodicities, can be felt in the mind except as the duration of periodicities. Periodicities are converted to time units by means of external cycles, as mentioned, so that the sense of the duration of any thing, event, or impression, can be translated to the hours and seconds of the clock. And how do we get the clock? We simply subdivide the earth-year and mechanise the contraptions in a mechanical device.

[70] This Einstein theory of time as space-time is a matter of serious concern in philosophy. Before Einstein, everybody thought time was a universal sense 'given' to man. Thus the religions had a ready-made, natural niche for God. The bishops are no fools; most of them are highly educated. Before Einstein's secular time, they always knew that time is so mysterious (in its passage and continuity) that it must have been provided by a Creator. Honestly, without Einstein's notion of time, I would have found it pretty well impossible to dismiss such ideas about time.

fact, it was the seat of learning for so long that many theories now recognised as scientific may well have passed through the major religions disguised as providential edicts or revelations, and without being properly understood.

The internal sense of time as duration may be invoked by the Minkowski proposal, but duration is not 'complete' time; it is not complete as time. Whether or not he was aware of it (and he gave no indication that he knew it), we may charitably accept (or grant it, at least for the sake of argument), that the Minkowski *i* invokes time because the internal sense of time is always there as duration in the mind, otherwise his formula could not have made sense to anybody as a theory of time. It must be emphasised strongly (or repetitively again and again)[71] that the sense of duration is not time *per se* on its own; it is not complete time that could be used in anyway---it cannot be mechanised in the clock, for instance. To be able to use time such as we have in the clock duration must be linked to external features of the world. The union with external cycles is vital: first, for having time in units; secondly, for its generalisation as we have in the clock; and thirdly, for explaining how it passes and seems continuous---the so called 'perpetual time' of the religions.

At all times there must be recognition that time is a union between the internal sense of time and external cycles. Minkowski failed to notice this; he made it the union of space and time---but it is the space we use for the time in the first place. How do you unify the time with the space again? The time derived from space becomes 'the product' of space and points, and therefore cannot be linked to space again. Logically no mathematics can do that because physically it is not feasible. Mathematics does not alter physical reality; it only reflects it in a tautological fashion by way of symbols, or symbolic language, instead of words.[72] Professor Eddington

[71] Let me stress again that the subject is difficult, therefore repetitions are unavoidable---in the same manner as mathematical treatises repeat equations by numbers over and over again!

[72] See a discussion of this in Appendix II below.

noticed this anomaly, and remarked that time is a union between the internal sense of time and external cycles, although he did not spell it out as I am inclined to do. Time is only a concept (a tool for the study of nature), that we apply to organise the outside world to our advantage. It is not a physical entity, but based on life so closely that they are difficult to separate, as the sense of duration is required. It is the same thing Bertrand Russell said about space-time. He said that, as it appears in mathematical physics, space-time is "…a structure in which materials found in the world are compounded in such a manner as to be convenient for the mathematician…"[73] So is time, in which case it is for the convenience of man's organisation of nature to his advantage. When we re-define space-time in the original sense of 'local time', we will realise that space-time becomes a concept not only for the convenience of the mathematician, but for the whole of mankind---as time for short, which is precisely how Einstein regarded it.

Still we grant charitably that the square root of minus one, as time, will hold good at least in mathematics if not in sense; but so, also, will any other symbol we care to use. Exactly as stated by Einstein: "…we must replace the usual time co-ordinate t by an imaginary magnitude $\sqrt{\ }$ --1.ct…" Similarly, we can replace t with f, g, or h. In each case we know we are talking about time as duration in the mind otherwise it does not exist as a universal phenomenon out there.

So the Minkowski proposal is not a discovery; it does not introduce any new facet of physical reality as 4-dimensional geometry. Stated clearly like this without his camouflaging mathematical symbols, any logician will notice that it is sheer humbug. For time is there in the mind; any symbol we care to use can invoke it. It is there in the mind otherwise the Minkowski idea by itself could not make sense in the absence of a universal time, as we would have no idea of any other time. And if it is already in the mind as the requirement to

[73] *The Analysis of Matter*, Op. cit. Ch. Xxxvi.

make the Minkowski theory credible, then what really is the point of all this counterintuitive mathematics to conjure it by way of the imaginary time co-ordinate? I fear it suggests the unthinkable, namely, a religious attempt to outwit Einstein and create a fertile ground for the notion that time is *still* mysterious---to frighten mankind that it is so mysterious as to be linked to space into one phenomenon that is nevertheless impervious to our normal senses. On the basis of his imaginary quantities our physical reality is permanently altered to a new one of 4-Dimensional geometry, from which really bizarre, even scary, concepts of time and curved space-time are taken as proved by Minkowski.[74] This is not good enough as part of physical theory.

As a kindly advice to the novice, in the section of his book where the above quotation is taken from (Sect. 17), Einstein pointed out the fact that, "Minkowski's work is doubtless difficult of access to anyone inexperienced in mathematics…" This is another way in which the Minkowski formula for equating space to time to create the 4-D geometry is camouflaged with mathematics so much so that even the great Einstein was fooled. The complex mathematics refers only to the deductions based on the theory that equates space to time as a union of one entity creating a 4-D continuum. All the deductions in his mathematics depend on the ict equation holding good in logic. Having convinced everyone that it is irrefutable, he jumped to the conclusion that, therefore,

[74] It sounds phoney yet most mathematicians and cosmologists would bet their lives on it as the true reflection of physical reality, with the honourable exception of Professor Eddington. He was unique and as adorable as Einstein and Russell; among the critics of the Minkowski formula who were not philosophers, Eddington was the highest-placed scientist and mathematician; besides, he could really and truly claim to understand relativity. So his views are important, and they were that, as repeated all through this book, the formula is fictitious, 'pure and simple', as Einstein would put it. It's no use trying to defend it: it is simply not true of the external world and exists as true only in the imaginations of mathematicians who claim that it helps them to understand relativity. This is the true state of affairs, and must be emphasised most strongly because Minkowski distorts relativity, special and general.

‘s=ct…’, and the rest, as they say, is history. Without examining the logic of it, mathematicians simply accepted it as part of natural law. This is like Communist propaganda. The ict equation is based on an arbitrary assumption without merit in logic, therefore all deduction based on it are also false and unacceptable, least of all, as part of physical reality. In other words (if they are necessary) only the ict and s=ct equations are important in logic, but they are easy to understand. The problem is that they are the most difficulty to verify. The whole magical success of Minkowski is due to the difficulty in verifying the ict equation. His followers did not bother to verify it or listen to Russell and Whitehead and their objections; instead they accepted it as true and moved on to the more complex mathematical deductions based on it.

But if we reject the basic equations as flawed, we need not go into the complex mathematical camouflage with which he promoted the myth that space and time are, by his mathematics, unified into one entity as 4-D geometry of the world.

To summarise: it is suggested that, in human beings, the sense of duration is universal; everybody has it; it comes from part of the mechanism for memory, and it is the awareness of things enduring, or lingering---enduring and lingering means time is going. Hence every human being is familiar with duration as the internal sense of time invoked by any motion internally and externally (things like ageing, to and fro, up and down movements, depletion, growth and decay.) As a result time is the only thing that does not have to be explained to any sentient being; even when it is set in mathematics it is easy for people to learn and understand. Instinctively everybody understands duration, but that is time in psychology. We link that to mathematics, and mechanise the device in the clock as time for general use on earth.

It is extremely important to note that there is no suggestion that we all subject the sense of duration to external cycles to get our time in units as we go about our daily affairs. This has been invented for us by the makers of the clock. We just use

the clock, as quantified time, without bothering about the metaphysics of how it was created.

However, it should never be supposed that time is definable. It is not possible to define basic time---say, the year. We define all other units of time in relation to the year. But how long is one year? One definition of time I like to use is that given by the famous physicist Richard Feynman. He called time 'how long we wait'. Feynman's idea is not original; it is pragmatic; that is what our time is. But for the sake of argument, let us say his suggestion is accepted. Accepting this idea means any cycles can be used for time, or to give rates of time as it passes by. To know how long we wait we can employ our hypothetical school boy to go round the Cathedral again. That will give rates of time lapse. He may have gone round seven times before the next bus arrived. Assuming a state of mathematical accuracy and regularity, you can then say something like this: after the last bus it will take the school boy going round the Cathedral seven times before the next one arrives. That is also time, no different from the earth cycles except in length. Normally we state how long we wait in some of the earth-year's sub-units; but they are sensible only as related to the year. But if you have to wait one year, how long will that be, without mentioning any of the constituent units derived from the year, as they cannot be logically used to define the year without contradiction? Or you could do so, but then the unit you employ (second, minute, hour, month) will also have to be defined as a natural length of time without reference to the year. We know how many seconds makes one year. It is approximately 31, 536,000 seconds. But then how long is one second in its temporal duration? I mean this in terms of time duration not space. Of course we know the velocity of the earth per second. That is time by space, since it is the earth's journey round the sun we divide to get the second. But in terms of duration nobody can define the second or any other time unit---except that the whole of the earth-year's sub-units can be defined in term of the year. Then we are left with the year, and can never define it logically in temporal terms.

Professor Richard Feynman also tried to define time in terms of space. I mention Feynman particularly because he was brilliant, and reputed to be the greatest physicists after Einstein in the 20th century. This unique distinction is claimed (not to say usurped) by many countries for their own scientists. Here in Britain many scientists are also reputed to be the most brilliant since Einstein. We take these claims with a pinch of salt. But Feynman was taken more seriously, after all he won the Nobel Prize, and his lectures and books were highly praised. Yet when I examined Professor Feynman's definition of time in terms of space, I found that he was discussing space-time. He wrote "…nature is telling as that time and space are equivalent; time becomes space; they should be measured in the same unit…"[75] This is different from saying that the second comes from the year as a sub-unit, therefore the second is part of the space traversed by the earth round the sun which we call a year. In so far as the second is part of the year it is also part of the physical space traversed by the earth in one year. But the year is our basic unit of time, and it is logically indefinable in pure temporal terms. We never know how long is one year in natural time, since there is no such thing as 'natural time'. What we call time consists of external cycles chosen by man to convert the internal sense of duration (of anything whatsoever) to shorter periods of existence---or time units. The year, for the avoidance of doubt, is a shorter period of a person's life. But how short, or how long, no one knows. When a year passes you do not know how long of your life is gone with it. All we have to use for time is one orbit of the sun, called, 'a year', sub-divided down to the seconds and so forth.

[75] Professor Richard Feynman, *Lectures*, Book One, Section 1-17.

SEVEN

Refuting Minkowski

Perhaps refuting Minkowski deserves a full chapter to itself, although I personally don't think so. But just in case the reader would prefer to have my grounds for rejecting his theory grouped together, I give below the main grounds for rejecting a theory that has been declared even by one of the leading experts of relativity, Professor Eddington, as fictitious. The Minkowski theory is not a major philosophy to tackle it so seriously; but it deals with time, the second most important subject in human life. And the way it deals with time is philosophically unacceptable; it must be refuted root and branch.

(1) Time is central to the Minkowski formula, yet it is only invoked with an imaginary time co-ordinate. This is logically untenable because there is nothing imaginary about time. It is so real and oppressive in all human affairs that we dread its passing as it brings ageing, associated with infirmity and death, or, at the social level, missed appointments.

(2) It is evident that Minkowski failed to define time in *clear* terms as to whether it is universal or discrete. We are certain that universal time does not exist (time dilation, the concept of local time as time, Einstein's analysis of order and simultaneity to show that no unit of time is universally applicable, together with his theory of frames all confirm that "there is no longer a universal time".) Yet the Minkowski theory seems to imply something like a universal time that is invoked with mathematical symbols.

(3) Minkowski said plainly that time and space are unified from the time he announced his theory. He actually stated that

'Henceforth space and time constitute one entity, etc.' It is true that under relativity space and time are not seen as fixed but rather as dynamic, however the concept of local time which Einstein transformed into space-time to the effect that every inertial frame (local space) will have its own time implies that time is obtained from space with the application of points to space. This means that time is a product of space and points; therefore it is contradictory and against logical reasoning to claim to be capable of linking time to space to form one entity. As the product of space, it can only logically be added back to space, as we know in the 3+1 formula. A thing cannot be the product of space and yet be naturally and inseparably the same as space again. They are related, certainly, but not one and the same thing.

(4) The Minkowski ict equation mentions time twice---as mentioned before; the *i* is supposed to invoke imaginary time, yet that is multiplied by ct, being the velocity of light and time. I am at a loss to know which other time again? Where does it come from? On this issue, I am inclined to abide by what Einstein himself said. He is the master of the whole idea; and, as quoted from his book, he states clearly that *i* is supposed to represent the usual *t* for time. So how does Minkowski multiply the *i* by ct again---where is the extra time of the ct coming from?

(5) As Professor A.N. Whitehead has pointed out, time and space still pass through nature separately, and he was an outstanding mathematician, so nobody can accuse him of failing to understand the Minkowski mathematics purported to linked space to time.

(6) If space and time are naturally linked, we could never have had time on its own, or space on its own, as the situation was before Minkowski---and still is, as Professor Whitehead has pointed out.

(7) Over the 30 or so years that I have been working on the problem of time, and sending many technical papers to the academic journals, I have encountered many insults and references to elementary mathematics almost all of them in

defence of Minkowski, so much so that I once wrote back to advise one writer that at this level his contribution was so elementary as to be an insult to my intelligence! The ds^2 formula, the square root of minus one, the Lorentz Transformation formula, and his equation for his Esynched clocks $t^1 = t$ -- Vx/c^2 have all been mentioned to me, sometimes by the referees of academic journals who know nothing beyond formulaic concepts and mathematics. They often fail to remember what happened over the eather debate before Einstein. And they believed that mentioning these old ideas would put me off. However, being simple in nature, if not in mind, I always go back to the master Albert Einstein himself. He gave us no complicated mathematics. He just said, and I quote again, "…. we must replace the usual time co-ordinate t by an imaginary magnitude…" That is all a logician or philosopher wants to hear. For the point of contention is this: the basic Minkowski mathematics equating space to time is called 'ict'. It relies on *i*---as an imaginary time co-ordinate, exactly as Einstein put it. (See my notes on mathematical equations in App. II below.) So according to Einstein himself it is an imaginary time co-ordinate. But there is no such thing as "an imaginary time" to have its own separate co-ordinate in the determination of the nature of physical reality. This formula is obviously wrong---no one should try to defend it.

(8) What really amazes me is that mathematicians overlook the fact that linking space to time is intellectually more important than the discovery of the cause of gravity by Einstein; and yet, while they are prepared to go to the African jungle to test the Einstein theory of gravity, they accept the Minkowski formula on 'thinkability' as Einstein himself put it, instead of subjecting it to the most rigorous logical scrutiny. Yet it takes about just a moment's reflection in logic to realise that imaginary time co-ordinates cannot support such a major shift in human conceptions of time and space. Space-time as 4-D geometry, if true, must be the greatest scientific theory of all time---yet even Eddington told us that it is just not true of the physical reality we have to deal with in physics and

technical philosophy. Even by saying its proof is something to be regarded as thinkable, Einstein inadvertently exposed the theory as logically flawed.

Furthermore, the way Eddington put his mild condemnation of Minkowski was not good enough. As a book entirely devoted to the mathematics of relativity, Eddington had a duty in his *Mathematical Theory of Relativity* to inform readers as to why the Minkowski mathematical interpretation of relativity was arbitrary or fictitious; for these are, after all, quite serious condemnations; and this is a very serious matter, too, for relativity is a completely novel theory of physical reality, and it has been proved experimentally. To try to interpret it mathematically only to end up promoting fictitious theories is a very serious charge indeed. But Eddington failed to enlighten us.[76]

However, here are my own philosophical, and perhaps less technically, reasons. The truth of the matter is that parts of special relativity are philosophical because of time. Thus some of his peers called Einstein 'philosopher/scientist', and all the evidence is that they were right. As a result, the whole of special relativity cannot be rendered in mathematics. Lorentz saw this, as he later admitted that he failed to discover the special theory of relativity because he did not take what he had discovered about time seriously. That discovery was 'time dilation': to the effect that speeding clocks run slowly. Deductively it leads direct to the concept of local time. Your local time runs for you normally; but it will be seen as running erratically by people looking in from outside your locality.

[76] It is not enough for Professor Eddington to say the 4-D geometry is organised (or drawn) like the latitude and longitude lines are drawn on earth. We are living with these imaginary world lines without encountering any problems in physics, but we cannot live with the 4-D geometry without causing problems in physics and philosophy. In physics because it has to be true else it contradicts special relativity; and also in philosophy because it seems to make time universal again ---something that can be invoke with mathematics, rather than something that can be created locally for local purposes.

My own opinion is that, apart from the two postulates and the Einstein theory of frames, Lorentz could, indeed, have discovered special relativity, but because of them he never could have done so merely by taking his own recently discovered t^1 seriously.[77] It is that discovery Minkowski referred to when he said his theory of time had 'sprung from the soil of experimental physics'. Since he was a very good mathematician, Minkowski must have noticed the difficulty with time in making special relativity purely mathematical, and, I think, decided to get round it with the suggestion that time and space constitute one entity. In other professions this might be called fraudulent; here we can only observe that it is illogical, simply because one cannot cheat nature.

The fact is, Minkowski got away with it because relativity is not affected on this planet however we define time. Thus Professor Eddington could insist that "we shall continue to employ it." He is saying scientists or rather mathematicians shall continue to employ a theory he had accurately described as fictitious and arbitrary. *The technical reason is that the Einstein condition that time should be a separate co-ordinate in the description of phenomena is fulfilled no matter how time is defined*. *All time looks like universal time due to the common earth-year periodicities we carry in the mind.* The difference is in how it is obtained: either it is created by man as 'relation between points', or it is assumed to be 'given' as a

[77] Innocently he called it 'local time', something of a mathematical curiosity, and left it at that. As always displaying wisdom maybe from outer space, Einstein said every time is local time, therefore that is all there is of time, 'pure and simple', and that universal time does not exist, and thereby discovered special relativity. The mathematical curiosity was merely a fact of nature, namely those travelling with the speeding clock would notice no difference in its performance; those outside who notice some discrepancies in its performance are in a different frame of nature. They should not have looked in, or spied! Thus time dilation is not a mystery. What is mysterious is the fact that the universe consists of different frames, each with its own different set of natural laws, which is the cornerstone of the special theory of relativity. To understand relativity, you have got to understand this concept of frames, together with the curvature of space, which is also the cornerstone of general relativity. Both were unique Einstein brain waves.

providential bounty as they do in theology, implying the total rejection of the Einstein notion of time.

Another critical point is when the 4-D geometry (carrying time with it) is applied to other frames, including that of general relativity, since the periodicities are those unique to the earth's cycles. I think mathematicians simply employ earth time from their minds in breach of the theory of frames. Let me explain what I mean: time has to be quantified; that is where the earth's periodicities derived from the peculiar conditions and cycles of the earth are our sole means for doing so; otherwise the word time has no meaning. Time is always 'how much time'.

Moreover, in practice as opposed to theory, it is in the determination of how much time that problems arise. Hence the term 'proportional' is employed in the Minkowski equation. But proportional to what "standard unit of time"? Or proportional to what? To decide that we have to use the earth's cycles; the units of time used proportionally are limited to the earth and its cycles alone. So Einstein was right, because that makes earth time applicable solely to the earth. Otherwise we are transported back to cosmic time where units of time are there free for anybody anywhere to invoke, and the same everywhere. Thus the mathematics of Minkowski is not even relevant, since there is always time in every action, every event, and every situation. It is carried in the mind. What Einstein meant was that, having disproved universal time, and made time local in origin in a fragmented universe where time must be limited to a frame, he naturally realised that time must be physically added to phenomena to make the natural laws of a frame uniquely limited to that frame. That is why his equations for motion in special relativity consist of the three natural dimensions of space, plus time---that is, plus our peculiar time units derived from our own space. If time "is" universal he would not need to do that.

But Minkowski cleverly saw that time is always in the mind and so any symbol we use will be able to give us time in the earth periodicities to which we are accustomed. However the

time units to which his 'proportional time' has to be proportional to (the hours, minutes, seconds and so forth) belongs solely to the earth; they are the periodicities derived from the earth's cycles, and under the theory of frames, cannot be applied to other parts of the universe---how therefore can the 4-D geometry whose time (or implied time) is based on the earth's own periodicities be universally applicable? In other words, how can the 4-D geometry be relevant to the world? The time that it will invoke is the very same earth time we all carry with us in the mind, such that any symbol we care to use can invoke it. The rule is that in every frame the time appropriate must be one derived from indigenous cycles, precisely the way we get our time from the earth's cycles. For this reason a second here cannot be the same as a second somewhere else. Thus earth time should not be applied to other frames (including general relativity, I must stress again), if time is not a universal phenomenon. And we all know that the reason why time is not universal is cast in concrete because of the insurmountable evidence presented by time dilation and the local time concept based on it, even if the analysis of simultaneity is disregarded, but I doubt that we are at liberty to do so.

Yet, Professor Arthur Eddington also said, "… we must endeavour not to lose sight of its fictitious and arbitrary nature", while continuing to employ a theory that he has described as arbitrary and fictitious. Where in the gamut of intellectual activities do scholars do that---that is, use a theory that is not true with whatever caveat? And why should it work? I believe it works because the time periodicities it invokes are already carried in the mind and are derived from the earth's cycles. But that is in violation of the Einstein theory of frames.

The question is why Professor Eddington had to say that the Minkowski theory is arbitrary and therefore could only be used with that caveat in mind---to what purpose? If it is not true, it must not be used. But if he was going to continue to use it what is the purpose of the warning about its fictitious nature? One reason, I suspect, is that people instinctively use

the earth's periodicities, since relativity is not affected however we define time. A second reason is that (as mentioned below in the Epilogue) in another part of the same book (his Mathematical Theory of Relativity, Ch.1.8.), he observed that "The rough measures of duration made by the internal time-sense are of little use for scientific purposes, and physics is accustomed to base time-reckoning on more precise external mechanisms." So he was aware that time is carried in the mind with us wherever we go, and whatever we do.[78] And that is correct, as I have argued throughout this book. In other words, the erudite Professor realised that time is not entirely mathematical, but partly philosophical, since it involves the internal time sense as the sense of duration, based on the memory's facility for retention, the sense of things lingering, or enduring. Because of this, time can clearly be seen as the union between the sense of duration and external cycles. Therefore it can never be rendered entirely mathematical. So he called the theory he was using 'fictitious and arbitrary'. But, philosophically, that is an admission that the whole Minkowski theory is illogical and untenable.

As a result, the Minkowski business is not a simple one. It is not just a matter of deciding whether to accept or reject his theory; it goes deeper than that. We start with the special theory of relativity, where the equation for motion consists of four parameters: the three natural facets of phenomena, plus time. And since we cannot contradict the special theory of relativity, the debate is as serious as the one about the truth of the Platonic theory of Forms/Ideas. It is a vital philosophical quandary with implications for theology; but it cannot stand as part of physical theory because it rests on imaginary

[78] The problem is whose time? If it is earth time it cannot be used outside the earth---but they do, because relativity is no affected whether the time is considered general or local. However, in general relativity cosmologists are experiencing problems, so much that their suppositions seem bizarre. Furthermore, it will not be possible to link the quantum to general relativity while the time used in general relativity is not relevant to that frame, for the quantum is time-dependent. The time by which it materialises is earth time, relevant to the earth and its cycles alone.

quantities. Even theologians and philosophers of the various schools are exhorted by scientists to accept only objective reality as experienced through the senses without complex theoretical explanations of what is experienced. But, if so, then the first casualty is Minkowski, also a mathematician. His formula, so adored by mathematicians (the very people who affect to report on reality strictly objectively) cannot be accepted as part of the corpus of physical theory.

I wish to end this section with my own thoughts about the conflicting theories of Minkowski and Einstein concerning the nature of physical reality, as regards whether man contributes to the nature of physical reality with his time, as Einstein proposed, or time is intrinsically inherent in space already as Minkowski suggested.

I can see the merit of the Minkowski formula and appreciate why mathematicians regard it as useful---no more than that. Since Einstein had shown that cosmic time did not exist, the 3+1 formula suddenly acquired the aura of the most serious philosophy of physical reality for two reasons. (1) How do you get the time in the absence of a universal time before you add it to space? (2) Who is going to add the time to the normal dimensions of phenomena as a separate (or additional) co-ordinate? A role was reserved for man the observer to become part of the observed, which introduced a whole new facet of physical reality. Minkowski disagreed; and he was clever enough in mathematics to be able to disguise his disapproval with intricate mathematics. He sought to answer both questions with one complex mathematical formula. The solutions, he said, come from making (or recognising that) time is naturally part of the physical dimensions of space, or phenomena. If relativity had been well understood at the time, logicians would have realise that the two systems of Einstein and Minkowski threw the philosophy of physical reality into a confused and dreadful intellectual quagmire; either way the world of sense was changed out of recognition.

I say this because it has to be realised that this is a discussion of the ultimate of physical reality. A subject that is not legally

restricted, yet only a handful of humankind can access it, let alone make contributions to it. To say it is difficult is an understatement. The reason why up until now relativity is not properly understood, some say, by anybody. As such, in this rarefied area of human thought, we are only permitted to call something useful; we have no cosmic authority to declare anything as 'the truth' in physical reality. That is the role of logic, and logic alone.

Concerning the debate itself, Professor Eddington puts it best. He says of the Minkowski system that "…it is of great utility and convenience in describing phenomena…" That is true; but then it happens to introduce another problem (its own problem), so that we have two worries. One is the controversial Einstein 3+1 system incorporating a new conception (or philosophy) of human nature, and therefore only partly scientific; although everybody recognises that it is a profound theory with many merits never seen in physics before. The second worry is with the imaginary quantities of the Minkowski theory.

Einstein made man (the observer) part of the observed, regardless of the metaphysical status of man in the cosmos which he did not bother to mention and rightly so---as he has to add the time to the other dimensions of space. One can imagine that from the Einstein point of view, no matter how man got here, and for what purpose, he contributes something to reality as we know of it.

Let me spell this out clearly: The three standard dimensions of phenomena are natural; the addition of time to phenomena as a separate co-ordinate is a conceptual novelty introduced by Einstein, but it has been shown to be correct. The only drawback is that it is additional to the other dimensions of reality. Knowing time as it is (or was known to be), namely independent of space, how was the addition of time to space as a separate co-ordinate to be achieved?

The answer is that a role was carved out for man to add the time; the observer became part of the observed. That is clearly not scientific, it is conceded. To be more scientific time must

be shown to be physically part of geometry, if possible, as part of the natural dimensions of space, or phenomena. Nobody, to be sure, asked the question; Minkowski asked it and proceeded to solve it to the apparent satisfaction of mathematicians.

He just took it upon himself, saying if Einstein had paid attention to mathematics when he taught him, he could have made time part of geometry and dispense with the philosophical idea of man rather having to add it to phenomena. As Eddington says, such a system is of great utility. But what of the additional worry it brought about? For, to make time part of geometry, Minkowski had to rely on imaginary quantities. Imaginary quantities just do not exist, or do so only in the imagination of mathematicians; and we know that they are allowed to do that in the course of their work. Yet what was at stake was a reliable concept of the real nature of the external world on which we depend, physically, for our existence.

The Minkowski method was declared unacceptable by the philosophers, while mathematicians insisted that it was good enough for them, because it made the new Einstein proposal easy to handle, in the sense that instead of rejecting cosmic time, and inventing our own time before adding it to phenomena, time was supposed to be naturally part of phenomena already---how very convenient. Thence mathematicians and cosmologist only had to mention "The Minkowski Space", and all is light, simple. Unfortunately, nothing in nature is deliberately arranged for our convenience. It takes centuries of persistence and perseverance, ingenuity and toil, to discover what we can use to make our lives comfortable in the world. And that is the reason we worship inventors and scientific geniuses.

I must stress that the whole episode with Minkowski and his supporters in the scientific community, then and now, only goes to justify the novel Einstein proposal of which the debate is all about, namely that in the study of nature time must always be added to phenomena as a separate co-ordinate

otherwise theories will be falsified, or be simply inaccurate. That is the logical foundation of the new Einstein interpretation of the external world. The argument over methods of achieving that must not be allowed to obscure the fact that the Einstein original discovery is a vital change in the philosophy of nature and man's relation with nature, taking man as part of the observed. It is necessary to bear this in mind always. In fact, the hassle over methods proves the importance of the discovery, which is that if time is not added as a separate co-ordinate to phenomena, theoretical physics is wrongly footed. The argument with Minkowski, being universal, is evidence that the scientific community has accepted the Einstein new philosophy of nature as correct. However, if the Minkowski formulation is wrong, then time is not taken into account properly in theoretical physics. We have to ponder the consequences of that deficiency in relation to what is now happening in theoretical physics and cosmology, since we cannot get the same results with the 4-D geometry as we get with the 3+1 formula.

This debate, however, is the pinnacle of all logical discussions about the nature of physical reality.[79] So, on point of logic, we are obliged to adopt the Einstein proposal. One, because, with his new theory, he was able to solve most, if not all, of the major problems then facing and crippling physics. Secondly, Einstein took account of the role of man in perceiving what there is in the world. Whatever the physical world is, or is not, it is man who apprehends it so---or as so-and-so. This gives man a pivotal role in the determination of physical reality. Man decides on reality through how it is perceived by the human mind---or the brain-eye complex. That is not scientific; it is rather a philosophical enterprise. Yet that is the only way human beings can proceed, our only window on the world; that is what reports of the nature of reality to us; so it is part of the process of determining what the nature of physical reality is, because what the mind perceives is all we can experience.

[79] This debate is not new. Plato's simile of the cave made the same point.

Hence I see nothing wrong in his adding time to phenomena if that is the only way man can make sense of reality. And Einstein had proved in the special theory of relativity that with time added as a separate co-ordinate to phenomena, several outstanding problems could be resolved scientifically. So the human addition of time to space can be incorporated into science; it does not falsify it; it improves it, as special relativity has demonstrated.

The mind reports on physical reality; what the human mind finds to be there in nature is all we have to work with; so if we add time as a co-ordinate to space and it works, then that procedure is scientifically acceptable. As Kurt Gödel has shown with his theorem, even arithmetic cannot do without undecidable elements---as the Dictionaries put it: all such propositions are bound to "…contain sentences 'S' such that neither 'S' nor the negation of 'S' can be proved". Thus we are left in no doubt that man cannot know everything; the best we can do is to rely on the data from the senses; whether they are the ultimate truth or not, no one can find out. So when Einstein says we must add what we take to be time to phenomena, that precisely is what we have to do, however the time is defined.

A contrary formula that there is time already in all forms of phenomena and space, must define the time first, since no mathematics so far produced has been able to demonstrate that time is the same thing as space as space-time. If not, then we would not know what the theorist is talking about, and must revert to what our senses present to us as 'the time', which at present we know as the periodicities given by a link between the internal sense of duration and external cycles on this earth.

In any case, the two systems (of Minkowski and Einstein) are totally irreconcilable; so we have to choose between the two; and I think that the Einstein theory can be seen as the more attractive and acceptable---because it is not vitiated by arbitrary elements. To logicians and philosophers, the word 'arbitrary' carries an aura of unspeakable horror; and to be

fictitious is equivalent to being fraudulent; yet that is how Professor Eddington described the Minkowski formula.

Thus, since the Minkowski proposal is not acceptable as a valuable contribution to theoretical physics, we are left with the proven theory of Einstein, meaning that, with his mind, his only window on the world, man contributes something to the nature of physical reality. Perhaps we do not perceive the world as it really is, but all we can work with are what the mind reveals to us. And since what the mind reveals is part of the process of learning about the world, man is free to decide how to organise his materials for the control of the harsh aspects of reality from the data provided by his brain/eye complex we call "mind" for want of a better word.

The Einstein system correctly suggested that in the organisation of the materials found in the world for use in the service of man, adding time to the three natural dimensions of physical reality is the correct procedure---even Minkowski and his followers have accepted this, with the suggestion that time (is or) can be made part of phenomena with mathematics and does not have to be added as an external factor by man. In other words, Minkowski thought that time is naturally part of geometry, and set about to invoke it with mathematics.[80] As I have said, I agree with Minkowski too; I can appreciate why mathematicians adore his system. For if, having accepted the Einstein principle, some mathematical technique can be found showing time to be already, naturally, inherent in space, so much the better.

Unfortunately, what Minkowski suggested can only be achieved with imaginary quantities and therefore, as such,

[80] In fact, time is naturally part of the human mind's *modus operandi*---using points to delimit events---for duration uses points. Whether Minkowski knew it or not, what he did was to invoke the internal time sense with the square root of minus one, or his mathematics. The point is, since time begins in the mind as the sense of duration, any symbol we employ can invoke it; but that is not the whole of time. External cycles are required to have time that can be mechanised for all and sundry in the clock. The external aspects of time make it the product of points as applied to space---or simply the product of space, not part of it.

completely unacceptable.[81] But since the Einstein principle has been universally accepted as correct, we have no other option than use his 3+1 formula, whereby man is the one who adds time to the three dimensions of space as a separate co-ordinate to give us the proper understanding of the nature of the physical world.

But the reader should know that everything I have written here is exercise in futility born of my own buffoonery optimism. Mathematicians are presently unwilling even to countenance the mere revision of the Minkowski formula, let alone discarding it. They know it is not a true representation of the physical world, Professor Eddington told them so; yet they want to keep it. One wonders when they will realise that the fictitious 4-D geometry is corrupting all the work they are doing in cosmology and general relativity. The Encyclopaedia Britannica (Macro) tells us that, "practically all cosmologists *assume* that space-time is infinite in its timelike directions." (My italics.) The term 'timelike' was introduced by Hermann Minkowski. From what the reader has read so far in this little book, I am certain he or she will be able to judge whether time, as space-time, can be infinite---unless we are going back to universal time that permeates all the cosmos like a thread, which is what the Minkowski formula amounts to. For otherwise time cannot be conjured out of the thin air with mathematics that rely on periodicities which have come out of the earth-year, as the time for this inertial frame. Every frame has to have its own time worked out of its own repetitive cycles to get its own 'unique' local periodicities. This is what the Einstein notion of time amounts to; any other practices violate the special theory of relativity and are therefore unacceptable. In any case mathematicians and cosmologists

[81] A proposal to unite space with time should not even be contemplated under relativity, because under relativity the time is derived from the space---how do you unite them again? It is derived from space and independent so as to have its own identity. You have to have the time in hand before you can unite it with space; but once it is gained, it becomes independent. Logically it can only be added back to space. In no way can it be seen as the same thing as the space.

use the Minkowski theory as a formula in their notoriously formulaic supposition.[82] Thus they would write the equation for the Minkowski theory (either the 'ict…' or the 's=ct…') and move on---implying that the 4-D geometry is part of their theories. It is not clear that they rely on periodicities in their minds; but if they do, they are violating the rules in special theory of relativity, which says time is limited to a frame. Our time cannot be applied to other frames without ambiguities. No mathematical technique can achieve that feat, for the simple reason that you need periodicities in any time system; and the earth's periodicities are not pertinent elsewhere because they are based on the earth's peculiar postulates and mathematics.

The nature of other metrics cannot be guaranteed to be the same as that of the earth. It is easy to breach the rules in special relativity, after all Einstein is not holding a stick over our heads; but it should not be done, for Einstein presented his ideas as a logically deductive system. Taking parts away will not do---I mean to say otherwise he could not have solved the problems in physics at the time. Having demonstrated the truth of the special theory in that manner, it would be most unwise to violate any of the rules in Einstein's theory without valid logical grounds for doing so. The Minkowski formula cannot provide the valid logical grounds for breaching the sacred canons of special relativity.

[82] "**There are two great errors** (sic) to which the finest scientific brains are often prone. One is to embrace new thinking so completely that one loses sight of its limits. The other is its mirror image---to hold so inflexibly to the tenets of orthodoxy that one's mind remains closed to new and better ideas." (The Science Editor, of *The Times*, In his Review of scientific Books, Saturday, August 21st 2004---p12.)

EIGHT

The status of earth time in the universe

Let us begin this section with one important statement of fact about time: time consists of units---or single moments---as Professor Whitehead prefers to put it. The cardinal example is the earth-year. However it is utterly impossible to define any unit of time in the abstract such that it can be recognised when conditions for it are fulfilled. In other words, it is impossible to know what conditions will produce (exactly) what unit of time in any part of the universe. The year itself can never be defined in logic. Therefore what a second of time is can never be defined in such a manner that people can recognise a second when they see it. For this reason alone earth time cannot be valid in any other frame, including that of general relativity, and I think cosmologist need to be reminded of that. Now let us consider the status of earth time in the universe, knowing that it cannot be applied anywhere else, being a product of the earth's peculiar postulates and periodicities.

(i) How life appeared on this planet, and for what purpose if any, as a composite question, most dire, is the only conundrum greater than how we get the time by which man lives his life, and how the time moves on, or continues perpetually. It is not surprising that before the rise of science (and even still now) many thinkers believed that it is time that gives us the right to live;[83] the general idea was that life is based on time; whereas

[83] Strictly speaking, it is true that one's body gives him or her the time to live in the sense that your physiological make-up determined how long you will live. In the study of time, however, it is the other way round: time is based on life, for it is the living who counts the external cycles as years, otherwise there will be no years. So the time system is based on life, but

the scientific study of time indicates that time is based on life---somebody must be there to count the orbits of the sun as years (consisting of the seconds and all the rest of it), or there will be no years and no seconds, only bland existence in a senseless world. This brings to the fore for a brief discussion the question of whether or not there is time (or there will be time) in the absence of mankind (somebody) counting the orbits of the sun as years. As a question for serious debate it is akin to the problem of the existence of God, because it is so mysterious and of great philosophical significance. Is there time in the absence of human intelligence?

My own view is this: there is always motion of the kind we associate with time, like things moving on, growth, decay and ageing. Some thinkers assume this process to be time moving on, perhaps silently, without the intervention of human intelligence, or rather not even requiring man and his mind at all; that, naturally, trees will take time to grow, for instance. As a matter of fact, such natural events do not constitute time *per se*; instead, I see them as events occurring to certain objects in their own worlds, or in their own 'Beings': a tree grows, a river flows, a person is ageing, and so forth. It is not time we can mechanise in a clock. Things live their own lives to which time, once mechanised in a clock, can be applied; but the passing of their growth or decay is not quintessential time.

Although the general growth of, say, a tree can be explained as "time going". It is not the kind of repetitive cycles we can mechanise in a clock. All things that move or grow can be set to mechanised time; whatever happens to them happens through the passage of time. But it is not correct to call, say, the invisible growth of the human hair as time. It is not time but the natural chemistry of the human hair. Rather it is correct to regard it as "time going"---invisible time going. To

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the life has a span that can be stated in the language of time. The effect is to feel as if one is given 'a certain amount of time to live' at the end of which death will 'lay its icy hand' on him or her. In fact, the span is strictly determined by one's physiology, and can be manipulated or managed, because it is not fixed.

know how much time in physical and visible reality you have got to rely on mechanised time based on regular or repetitive cycles *and count them as the rates of time, the years, for instance*. If we regard every growth and motion, backwards and forwards, as time we would virtually end up in a confused world of myriad of time systems. So for scientific and logical thought we rely on mechanised time; all references to time should be reserved for mechanised time suitable for universal application in one inertial frame. (See 'Time and Quantified Time' in Appendix I below.)

Again, if we consider any motion as 'time' rather than as 'time going', the implication will be a reference to pre-existing universal time, not one created locally for local purposes as space-time in specific units which can only advance 'unit-by-unit'. On the other hand, the idea of taking any motion as 'time going' (in units), means the time must have been established already so as to have it in specific units.[84]

It has happened in the past that many things were used to mark time: the shadows of trees, of mountains, of houses, even of human beings. But since the earth-year is now used for time over the whole planet (albeit with zonal variations), we tend to interpret motion and events in terms of the amount, and length, of units of time expended, being expended, or, futuristically, to be expended. It is the same under the relativity notion of time. Time is now known as 'space-time'. Being the product of points as applied to space; space-time is necessarily discrete; it does not run through all nature. As such

[84] This idea needs to be noted carefully. In sleep, for instance, time is going. Time does not wait for anybody; neither does your ageing process, nor the earth's orbit of the sun. The idea of time marching on has grown out these experiences. It is partly true. Either we say time is marching on, or what time is based on is marching on, to show that time is partially based on natural events or repetitive cycles. The first statement is unscientific; the second is logically true. But when one is asleep time is going (meaning what time is based on is going, of course), but by how much time? To know this we rely on external cycles on earth. For this reason alone---quite apart from the theoretical postulates--- our time is limited to this planet only---this inertial frame alone.

we have to search for the method used to establish our own time, which, of course, is (and has to be) limited in its effects to this planet alone. In this situation, the only way to have one time for any inertial frame overall is to mechanise some repetitive cycles (the year, for instance) as time for all and sundry---with the inevitable zonal variations, depending on the size of the frame or planet. The clear philosophical implication in epistemology is that time does not exist in nature at all, if time is defined as "time in the clock". Yet only time in the clock is scientifically relevant. Sentience is required; intelligence is necessary; the ability to count is indispensable; and a theory of numbers is absolutely essential, all of which makes it seem as human in origin, but based on the natural sense of time as "duration" felt in the mind of anything whatsoever.

Even the concept known as "the passage of existence" is meaningful only as "passing through a human mind". Somebody must be there to count the orbits of the sun as years, and have the intelligence to sub-divide the year down to the seconds, or there will be no years and no seconds. The multifarious activities, motions, and events, in existence (growth, decay, to and from, up and down, backwards and forwards, and so forth) all occur to individual things and beings---human and animal, rock and plant. They are individual occurrences; things living out their own lives through their physiology and chemistry, physical and organic. Otherwise there is no time without human intelligence.

Let me stress that, nowadays, we suppose that what happens in nature, like growth, the flow of rivers, and so forth, are seen as the process whereby objects and beings live their natural lives. Each and every one can be set to time---but where is the time to begin with? They can be set to time only after an acceptable concept of time has been established with intelligence as applied to some repetitive cycles in conjunction with the sense of duration in the mind---in short, only after quantified time has been mechanised in the clock.

Thus one of the consequences of the space-time idea is that only mechanised time is true time for general application; all other semblances of time are just the chemical processes of things; but they are not useless in the scientific study of time because they can be set to time. The irony is that the attempt has been so successful that sometimes we tend to believe that time is naturally in existence, and say, for instance, that the flow of a river is an example of time going; yes, but whose time? Without time in the clock, the situation will be confusing, for nobody would know how much time is going. In a way the passage of existence and ageing is time going; but you have got to have the time in a clock to know how it is going, and by how much.

The huge varieties of objects in existence, each living its own life according to its chemical make-up, means that, although the growth of things may be seen as "time going", but that is not time for general use. I reserve the word 'time' for time in a clock, *written in mathematics as ct*. What that means is that it is time for an inertial frame, according to Einstein's theory of relativity. That time requires points and mathematics for linking the internal sense of duration to external cycles that occur repetitively. Such a time is the creation of the human mind.

(ii) Following from the above, another puzzle arise, namely, can we apply our parochial time to events in the cosmos at large, say, regarding its past, present and future? If not, the first question is, then how can we suppose that going round our tiny sun and calling it one year can be used as the yardstick to tell the age of the universe?

And while we are discussing such matters, what about the definition of the time content of one year---or how long is one year, and how do we measure how long one year is? For instance, as a matter of concern to all of us on this planet, when one year passes, you know you are aged one more year, that one year of your life is gone with it, but how much of your life span is gone---how do you measure that?

Thus, in my opinion, it is not very helpful asking how old is the universe, but how *old by our time*; there is no other yardstick. On realising that the largest (or longest) unit of our time is the earth-year, which is just a measure of one orbit of the sun, estimating the age of the entire vast, gigantic and mysterious universe by this yardstick ceases to have any credible meaning.

Recently some astronomers claimed to have discovered a planet orbiting a star millions of light years from the earth. For the sake of argument, let us just say the star is only one million light years away. A star at that distance will have emitted its lights by which it is observed more than the 15bn years reputed to be the age of the entire universe! In case one million light years seem fantastic, here is another report from The Times showing that a million light years is nothing at all. I quote from "The Times", News Section, 30th November 2007, p31: **"Hubble captures phantom galaxy: SPACE (sic)** It was so difficult to spot that astronomers nicknamed it phantom galaxy, but the swirling spiral arms of the galaxy Messier 74 have now been captured in a stunning new image…The composite picture shows symmetrical spiral arms dotted with clusters of young, blue stars radiating from a central nucleus. Messier 74 is about 32 million light years away from Earth…" Yet another report shows that 13-15 billion years (that is 13 or 15 billion ordinary orbits of the sun) are nothing compared to the most distant objects ever detected whose lights took billions of light years to reach us: "**Farthest galaxy of all (sic)**[85] A galaxy, which is 13 billion light years from earth, is the most distant galaxy in the Universe,

[85] Here is another interesting discovery: "**The super supernova** (sic) A supernova more powerful than any yet recorded has been discovered in a dwarf galaxy 4.7 billion light years from the earth. Measurements have shown that the supernova, 2005ap, was 100 billion times brighter than the Sun at its peak. The supernova, a collapsed star, was located in the Coma Berenices constellation and was discovered by Dr Robert Quimby, of the University of Texas, in the United States." (*The Times*, 12th Oct. 2007, p19.) I wonder if any religious person can tell us as to how important we are amid this gigantic vastness.

astronomers said. Light from the galaxy was observe by the Hubble Space Telescope. 'This is the most detailed look to date at an object so far back in time', Garth Illingworth of the University of California said."[86] Surely, the universe must have been in existence billions of years before this distant galaxy emitted its lights that have taken 13 billion light years to reach us for us to be able to observe or detect it, even instrumentally. There is no doubt in my mind that with this kind of Journalism, The London Times has become the best Daily Newspaper in the world.

(iii) I will now briefly consider some of the points raised above. For a start, time as space-time, based strictly on the space traversed by the earth in its orbit round the sun, has no connection (except theoretically) with the cosmic space the sun is passing through. We have nothing to do directly with the space in the cosmos at large being traversed by the sun. We are only concerned with the space traversed by the earth round the sun, simply because we have chosen that to be our principal time cycle, or time unit, and so all our other time units are the sub-divisions of the year. Another corollary is that our time is limited to this inertial frame. The units of time we have were worked out with the repetitive cycles peculiar to this planet. As such they cannot be applied to other worlds, planets or metrics outside this planet 'without ambiguity'. It all works out into a beautiful logic: Einstein said natural laws are limited to a frame. But these natural laws are based on peculiar postulates; we know that our postulates are that the speed of light is the same for everybody, and so are the laws of physics, known as 'the Einstein two postulates of special relativity'. Meanwhile he had made time a separate co-ordinate, in the 3+1 formula (ignoring the Minkowski intervention for now.) In this formula the time, which is space-time deriving from our peculiar space in the absence of a universal time, is also bound to be different from the times of other planets or frames chiefly because, as a separate co-ordinate, it is part of our natural laws on this planet. So, since

[86] The Times, News Section, p. 4, London, 14th Feb. 2008.

we have worked out our time units from our own peculiar cycles on this planet, they are not units of time we can apply 'without ambiguity' to any other planet or frame.

Of course, in this book we are basically concerned with time as Einstein's space-time. In the absence of Minkowski, we will write the notation of the Einstein space-time as $c^2\ t^2 = s^2.\ p^2$, where *c* is the velocity of light and t is for time, so that 'ct' taken together represents time, s denotes space, and p represents points---meaning time is space divided by points. Note that I do not start my equation from the point of view of space to time. I start from time to space. The 's=ct…' equation we encounter in the Minkowski formula is not a defensible postulate since we have no logically acceptable method for equating space to time. On the other hand, time, as analysed backwards (or as it is), resolves itself into space multiplied (or divided) by points.

The basic notation of time by the Minkowski theory is written as $s^2 = c^2\ t^2—x^2—y^2—z^2$, but that is not the whole story. He begins with his ict equation, precisely as given by Einstein above. With that space is assumed to be equated to time, and therefore s=ct. By contrast we think time is space divided by points as argued all through this book. *The time comes first because we carry it in the mind as the sense of duration, part of the human mind's process of remembering things*. The space and points are auxiliaries for the creation of time cycles to punctuate the duration, or subject it to shorter periods for cultural purposes. Thus daylight is long. But it will end. If you are a primitive man going to the farm---or doing anything at all---you need to know how long the daylight will last so as to prevent your need for a light to find your way back home, and not be caught out in the dark. Time is used to show shorter periodicities to enable you count the hours it will be save for you to be out there in the farm.

(iv) How does the cosmos figure in all this---that is, in the nature of our time? We believe we are here on our own as far as life is concern. The being of things offers no comradeship because everything is absolutely individual, except, perhaps,

things like the branches of trees, where one thing depends on another. A universal time might give the impression that somebody is in charge and knows of us because he has given us part of general time, our version of it. But once our time is seen as uniquely our own (and completely secular) its range becomes doubtful when applied to the cosmos at large.

As is common knowledge, there are stars so immense that a million of our petty sun can find room in them. Given this fact, does anybody really believes that going round our petty sun and calling it one year means we could determine the ages of events in the universe with the mere arithmetical accumulation of single units of our relatively short year? Even worse, can we really seriously use these short years to determine the actual age of the universe itself? I have already said it is not correct to ask the question 'how old is the universe?' The proper question should be 'how old is the universe by our time?' Otherwise, by whose time, since age is related to time? And the longest unit of our time is the earth-year, fifteen billions of which are merely fifteen billion orbits of the sun. What about the time before the sun came to be in existence? Furthermore, what of the time before the earth formed from interstellar debris into a planet and began to circle regularly round the sun each of which is one year to us? Even this is not accurate enough. We should begin from when mankind acquired the facility to count the orbits of the sun as years, a most recent event, by all accounts.

The religions have a lot to answer for. As infants we are forced to worship anything in the name of God. It is coercion, and it is criminal. However, I am really sadly surprised that the way and manner we get our years up to the centuries and even the millennia (merely by counting the passing years), has not undermined the so-called serious scientific theories of the age of the universe. These serious thinkers tell us that the age of the universe is between 13-15 billion years. Fifteen billion years for the age of a universe containing stars so immense that millions of our petty sun can find room in them; and especially when, in fact, one year is just the time for going

round this petty firefly of a star we call 'sun'? The simple fact is that 15bn years amount to less than three light years. So what about the stars beaming their lights millions of light years away? How old are they by our time?

(v) I have already shown that nowadays even the daily Newspapers disseminate highly advanced astronomical knowledge about the vastness of the cosmos. So we now know that the galaxy Messier 74 "is about 32 million light years away from the earth, in the constellation of Pisces. It is estimated to contain 100 billion stars, making it a little smaller than the Milky Way."[87] If that fails to set your mind swirling just ponder this: "At least a billion galaxies are scattered through the Universe, though the discoveries made by the Hubble Space Telescope suggest that there may be far more than once thought, and some estimates are as high as 100 billion. The largest galaxies contain trillions of stars, while small ones contain less than a billion." (Source: Philip's *Concise World Atlas*, 12th ed. 2002, page 3 of "The World in Space" section.) We know, of course, that the star system nearest to us (one with planets and so forth), is more than 25 million light years away. The light from this nearest neighbouring star itself will have taken more than 15 billion years to reach us, it amounts to nothing more than three light years. So how can that figure, more or less, be the age of our universe?[88]

(vi) In any case, here is another puzzle: how long is one year is a question I posed earlier. There is no answer and I know it. Let us be absolutely clear about this, we can never tell the length of the natural time period that one year contains, and yet the years are just repetitions of one year. Also we cannot

[87] From The Times of London. Op. cit. p31.

[88] In the mean time, let us forget about travelling to other stars. It is sheer humanoid vanity. It is not true that as we travel we age slowly and so a very fast means of travel would enable us to return to collect our pensions back home. The nearest star is so far away that it will take quite a few light years to reach it, even if we travel by the speed of light; and it will be hot and inhospitable---the mind buckles and boggles at these incredible facts about the universe.

use parts of the divisions of the earth-year (say, the months, days, or weeks) to define the temporal length of the year in cosmic terms. So we do not know *how long* in temporal estimates (or terms) is 15 billion years other than that it is 15 billion orbits of the sun, which, on cosmic scales, is too small to require much time to circle it.

Frankly, the age of the universe, in my opinion, is better left alone. It is not suitable for serious study, and it is not important anyway. The distant stars that are billions of light years away from us emitted their lights for us to see them all those billions of light years ago. If the age of the entire universe is about 15 billion years it means the universe itself is younger than the distant stars; and, if so, then what is the meaning of the word 'universe'? The truth of the matter is that these studies cannot be justified on any grounds whatsoever. The objects are simply too far away to have any effects on our lives, the only sane reason for studying the cosmos, apart from vanity, is intellectual satisfaction.

We can legitimately study stellar events without worrying about the actual age of the universe; so, let us just say it is not amenable to human ageing concepts. I doubt that any inspiring theories will be missed by forgetting about the age of the universe. The universe is unimaginably vast; personally I shudder to think of its extent, nature, and how it came to be; these are human terms; they don't seem to apply to the cosmos. The mind boggles. We have to remember that a human being with all his massive brains, knowledge, and theories about the cosmos is physically less than a tiny drop of water in the Pacific Ocean by comparison to the universe, even to a galaxy of a mere hundred billion stars. So far we have failed to make sense of it anyway; and it is about time to let it be. Astronomers can continue to skirt the fringes of some stars; yet again the nearest star is several light years away. I have known of ingenious theories of rapid travel across the universe, but do we suppose that the human body can bear the strain of these velocities even if they were feasible---and for what purpose?

Humanity should always be understood as limited to the earth and its dwellers; as annoying as it may sometimes seem to be, your humanity and love is to another human being who can appreciate them, and there is nothing sweeter and morally inspiring than the appreciation of your fellow human beings. That is why all nations have 'Honour Systems'. It is about time we thought more about the world than the cosmos; there is nothing it can do for us whether we are rude or humble to it. It is a cruel world; no efforts should be spared in trying to minimise its harshness. That is the first lesson in humanity.

(vii) Time has become a major problem in science because of Einstein. As Professor Sir Arthur Eddington has remarked, it was not so before Einstein. The scientific problem of time is different from that faced by philosophers. We have a situation where we are using time daily but cannot define what it is. Yet Einstein made time a separate co-ordinate in the determination of physical reality.

The basic unit of time, the year, is virtually indefinable; while other units of time can be defined only in relation to the year as sub-units thereof. At the same time there are elementary conceptual discrepancies in science about time: on the one hand, time is an artificial concept, called Space-Time, a 4-Dimensional metric of whose existence we have absolutely no evidence except that of imaginary 'thinkability'. This is ruled out of court by the logicians. And yet, on the other hand, in all science we learn that time is naturally in existence, and always passing. Yet what is artificial cannot be 'naturally in existence'. The natural aspect of time is the sense of duration in the mind. That is incontrovertible. Duration as time in the mind is always there, related to the sense of things enduring as part of the memory mechanism; for it takes time 'to endure'. Every sense of time is felt as duration in the mind---"during the 'life' of an event, or of so-and-so". In this connection, even the period of a second is also 'so-and-so'.

This sense of duration is known to everybody; and we link it through mathematics to external features of the world for time in the clock, so that any period becomes a mathematical

quantity. *The point is that when we do so, time is independent of space*. A useful analogy is to think of holding on to an image mentally, and then counting external cycles to determine as to how many cycles elapsed before the image died away. This is the ultimate rational principle for the having of time by using external repetitive cycles (the years, for example), and we owe it to the day Einstein had the insight to call the Lorentz t^1 'time pure and simple'. It is the best definition of time we have in science, psychology, logic, mathematics and philosophy---also in practice too; that is what time is, and the reason we have it in units. Let me repeat the definition in clear language. To have time in units for general use, we subject duration (the holding image, etc.),[89] to point divisibility by means of repetitive external cycles to get culturally necessary shorter periodicities of the passage of existence. For example, the seconds, minutes and hours are all part of existence passing away in specific units. In truth, they are merely artificial, shorter units, shorter periods of life as the life is still going on; the device for this was invented by man for cultural purposes: they are useful, because having an hour left, say, for doing something gives one time to plan well for success, and so forth.

So scientists must decide whether time is always (naturally) there as the irreversible passage of existence invoked by any motion, and passing in, say, the years, or it is not always (naturally) there because it is artificially created as space-time, implying that it is human in origin---sentience and intelligence are required for counting the orbits of the sun as years, and also for sub-dividing the year down to the seconds.[90]

The artificial creation must be linked to the natural time as the sense of duration otherwise there is no time, only multifarious existence, motion and other activities----to which time can be

[89] What may be described as 'the holding image, impression, etc.' of the sun is used to create the earth-year out of which all other time units are derived.

[90] The only idea for which there is no scientific evidence is that either of the two processes of having time can combine it with space into one entity.

applied, but only as units of time derived from the union between the sense of duration and some external features of the world, the earth-year, for instance.

Some scientific thinkers have settled for a definition of time that equates time to being; that time is like 'Being' exactly, and that ageing is time going and taking life with it. The problem with this definition is that time requires points, and points imply sentience. How otherwise do you divide being to get units of time? The superficial answer was that we use external cycles---the year, for instance. But when it was discovered that time requires space as well, as space-time (or relation between points), the idea of time running with "all being" as a universal mystery was discounted.

Above all, there is no such thing as "all being"; things endure through their own chemical constituents which are different one thing from another. Even two sheets of A-4 paper lying side by side are two different objects---i.e. to be two separate things there will have to be space between them; also moving from one to the other, however close together, involves different time co-ordinates.[91]

Secondly, being is not one. We do not all of us age in tandem; things and people are always coming into, and going out of, existence. Ageing is different from one thing, or person, to another. Due to differences in physiology or chemical make-up, everything and every body "exists" and "persists" by his or its own chemical make-up. And if being is not one (that is, identical for all of us, beginning and ending at the same time), then whose being is time? Who or what is carrying time for the rest of us?

[91] This is because Einstein made time a separate co-ordinate in the determination of physical reality. When the theory of time outlined in this book is properly appreciated, one will realise that it works out into a beautiful logic by which even the passage of time appears simple---and we owe all this to the mind of Albert Einstein. There are other contributors, of course, but Einstein formulated the basic framework.

Thirdly, we all carry with us the sense of duration, such that a certain amount of time is the same as a certain amount of duration in sense; this may be called the psychology of time. But duration too requires points for beginning and end. Thus the external cycles must accord with the sense of duration---e.g. a second cannot last longer than a minute either in linguistics or in fact, because we know what they mean from the sub-divisions of the earth-year. *When Russell said the Minkowski interval lacked 'non-technical meaning', this is what he was referring to, a sense of a period as duration in the mind. For example, you can say so-and-so is an interval of time; but of what value---how much time? On the other hand, basing any system of values for time units on the earth-year vitiates the concept of space-time as in the Minkowski sense that time and space constitute one entity, because the units of time are derived from the year with points. They are created by the application of points to space and are thus 'a third entity', making them separate entities from space. This is a very important point that should always be borne in mind---very important indeed.*

Also, the source or origins of the sense of duration must be examined. It has been suggested that it may be part of the mechanism for memory, 'the capacity to repeat'---the sense of things enduring or lingering, for it takes time to do so. Hence sentience appears to be necessary. Counting is also involved; arithmetic is essential. All this makes time neither wholly mathematical nor entirely philosophical, both are required for the proper understanding of time as a purely secular phenomenon.

Taking all this into consideration, time is now seen (in both science and philosophy) as so complex that simple, glib explanations fail to convey the whole of the essence of time. Above all, how does time pass by so that we can construct clocks to track it? It is more rational to say we 'track' time than say we 'measure' it.

We have been constructing clocks to track time for ages, yet we did not know how it passes by and seem continuous or

perpetual. The concept of space-time makes time essentially discrete. Discrete time, like the year, can only pass by through the procession of its units.[92] Hence the passage and continuity of time can be resolved with the suggestion that they occur through the procession of time units, again, like the year; so that there is only one year in nature, but by counting one year following another continuously, we can have continuous years, or continuous time, since all the other time units are derived from the year. In all this the lofty mind of Albert Einstein was indispensable. Strictly speaking, the theory of space-time was originally discovered by H.A Lorentz. He called it an auxiliary mathematical quantity, as local time, and put it aside. He did not know what to do with it. He thought it was a curious thing different from real time. As always, Albert Einstein saw things differently. He declared that local time is 'time, pure and simple', and that, by implication, means every time is somebody's local time.[93]

With great ingenuity in mechanics we have managed to create one local time to serve all and sundry on this planet based on the earth's regular journeys round the sun. That is the story of time so far; and that is what this book is all about. It is this beautiful theory of time that Hermann Minkowski seems to have distorted with his own different theory of space-time that equated time to space and vice versa, in his vain attempt to re-write the special theory of relativity with geometry---it must be noted that General Relativity was not known at the time. After his initial scepticism, even amounting to outright condemnation, Einstein was eventually persuaded to adopt the

[92] Again, this is one of the novel ideas completely unknown anywhere, and so strange that it has to be repeated to help the reader's understanding. To be sure, the ideas are not completely original, they are interpretative; otherwise it is all there in Einstein's works. But Einstein, like all great thinkers, is not recommended to be read direct without interpretations. He was, after all, without doubt, the greatest scientific man that has ever lived, bar Aristotle perhaps.

[93] From there it was easy for logicians and philosophers to realise that the logical definition of time is "relation between points" which their leader, Bertrand Russell, gave us.

Minkowski formula (only to the effect that space and time are unified into one entity), in General Relativity.[94] Even at the time it was described as fictitious, therefore we can assert that it is false; but it did not affect the truth of General Relativity as it was based on a real fact of nature, namely the curvature of space caused by the presence of mass. Whether that space is the Minkowski space or not is immaterial. It merely means that, as Minkowski space, it carries time with it inherently. So the nature of time in General Relativity did not bother Einstein at the time. I think this was so because the time invoked by the square root of minus one is accounted for by the sense of duration in the mind. I am certain that is what makes the Minkowski formula attractive, because it invokes time in the mind; but probably the followers of Minkowski have not thought about duration in this way. Without the sense of duration in the mind as the internal time sense, the Minkowski formula could not have invoke any sense of time to make it convincing. However, it is only the time we carry in the head. It didn't seem to worry mathematicians too much, as Professor Eddington has demonstrated by urging scientists to use it, while remembering that it is nevertheless untrue.

To a philosopher, this is a sad and painful situation of immense contradictions, since they consider the Einstein theory is demonstrably true, and brings with it the salutary results listed in the Prologue. *Thus time in the head, ever*

[94] This situation is what John Gribbin was alluding to in his article in the *New Scientist*, rather jovially entitled, "Pay Attention, Albert Einstein", cited above. Practically Einstein was coerced to adopt the Minkowski theory of 4-D geometry to the extent that he later praised it as of great help. He was partly correct. Professor Eddington has already told us that it is so useful that, although it is fictitious, they would continue to employ it. The simple truth is that Einstein brought in a new philosophy of physical reality—one that has the observer as part of the observed because he has to add the time co-ordinate in the 3+1 formula. It is a difficult theory in this form. On the other hand, if time could be shown to be part of space already, all will be straightforward. Well, in reality it is not; but they wished it was, and decided that, in the absence of philosopher-detectives, they would continue to behave as if it is so, and have got away with it so far.

since, has been illogically transferred to apply to General Relativity. My arguments here are aimed at convincing scientists that, after a hundred years, it is now about time to reject the Minkowski formula because the Einstein supposition can stand on its own whatever may be the nature of time, so that we can now search for the real nature of time in General Relativity---if it has one. Using earth time in general relativity (as "known periodicities" carried in the mind) is not only a mistake; it is a violation of the first principle of relativity because it is a different frame. The cycles we use on earth have given earth time peculiar, even unique, periodicities that cannot be applied 'without ambiguity' to other frames in the universe.

On superficial acquaintance, it might look as if this principle of frames can be violated with impunity; but the truth is that the Einstein theory was a logically deductive system. Take part of it away, and the coherence is lost either philosophically (in which case it may be harmless), or practically, in which case it would lead to distortions in physical theory sooner or later. Already I can sense that the difficulties encountered in the attempts to link general relativity to the quantum might be traced to the distortions over the nature of time as to whether or not it is part of space. All the philosophers who have considered the matter in depth agree that time is still independent of space, for after all the Minkowski formula relied on imaginary time co-ordinates, a practice which is logically unacceptable.

(viii) All this is also another digression gone too far. Let me now consider time in relativity overall. In fact, as mentioned above, time was made independent of space in special relativity, and, as is well known, at first Einstein called the Minkowski theory 'superfluous learnedness'.[95] In other words,

[95] And he was right. We cannot have imaginary entities in the determination of the nature of physical reality; for if we do then *what* we get will not be the true nature of physical reality---which is the problem in physics at the moment. But refuting Minkowski is difficult because time is in the mind, so that his square root of minus one can invoke it, as any other

not needed; I will add that it is still not needed and that by using it cosmologists are distorting the essential nature of relativity. So time and space were separate entities in special relativity. They couldn't be otherwise: "In the absence of gravity, space and time are distinct entities. In the metric of special relativity they play distinctive roles. But in the presence of gravity the *metric is altered*, and space and time become mixed up with one another. The metric has four coordinates, but the space and time coordinates become entangled. Only when gravity is weak can they be distinguished in a useful way…"[96] (The emphasis is mine.)

The insurmountable objection to this theory of time in a gravitational field is this: if the Minkowski space does not exist (because it is fictitious and therefore false, and does not reflect the true nature of physical reality), then "the alteration" in the gravitational field cannot alter our time. It all, in the end, depends on how one defines time. If time is space-time, or local time, its physical nature is as 'relation between points'. It is not something indefinable that can be invoked with the square root of minus one in mathematics, because cosmic time is abolished under relativity. Time is rather seen in exactly the way we get the earth-year: from point to point. The other units of time obtained from the year are also relation between points---that is to say, counting from one second to two seconds, and so forth. *For this reason, every unit of time on earth becomes independent of the year, or of the space*

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symbol can also invoke it. The only way to undermine Minkowski is to stress that we cannot have imaginary quantities at the very heart of physical theory. Those who argue that he must be refuted with mathematics overlook the fact that what is logically flawed cannot be refuted with mathematics---it suffices to point to the logical flaws, which as Eddington has said, are that the theory is fictitious and arbitrary. We are not trying, like high school pupils, to score points in mathematics. What is at stake is the question of the true nature of physical reality. Logic is the final arbiter; and in logic the Minkowski theory is arbitrary, and therefore false.

[96] Professor Jeremy Bernstein in *Albert Einstein and the Frontiers of Physics*, Oxford University Press, Oxford and New York, 1996, p.110.

covered by the year round the sun; thus Minkowski cannot use any of the earth's time units for his interval, as they are independent of space, but his argument is that time is not, or cannot be, independent of space.

That is the ultimate physical nature of time, for that is how we get our basic unit of time out of which all the other units are derived. If the Minkowski theory is not true then time is not the same thing as any space, nor is space the same thing as time.[97] Therefore the alteration in a gravitational field will not affect time. In fact there cannot be any system of time at all in a gravitational field, since there is no way of placing any points in the continually accelerating metric of a strong gravitational field for time to be had as relation between points---e.g. year after year after year. And without the year (or a similar system of tracking time), there can be no seconds, minutes or hours.

(xix) Let me stress that the question of time in a gravitational field requires more research, because our time relies on points, yet where to put any point in a continually accelerating metric for the having of time in units (year after year after year…as per the Meridian point) cannot at present be decided. When cosmologist speak of time in general relativity they are merely (illogically) infesting it with earth time, or the sense of

[97] It is in such situations that the defects in the formulaic way of doing mathematics become clear. The reader will now understand why I started with my own critical comments about formulaic mathematics, or methods in science generally. They are indispensable since they can lead to simplifications; but once in a while, they become obstructions to clear thinking. To avoid that, one must endeavour to define everything absolutely clearly. However, in the Minkowski formula, nobody defines time. It is taken as 'understood'. Time is time, that is all. Unfortunately, under the concept of local-time, what was previously regarded as time has been, in Russell's word, 'abandoned'. So one needs to work out how the time he is talking about is obtained, namely as relation between points in your local space. For that is what local time means. Its transition to 'space-time' did not alter its real physical reality. All Einstein said was that local time is the true nature of any time at all.

duration in the mind.[98] Nothing in general relativity has been settled with absolute certainty other than the curvature of space and the other deductions that can be made from the curvature of space all the way to black holes. Scientists should be careful about time in any metrics other than our own inertial frame, the earth; for the seconds and all other units of time are derived from the earth-year with mathematics. If time is limited to a frame then our time cannot be instinctively transferred to other metrics, or frames.[99] Where, for instance, does the second come from? I am sure many scientists and mathematicians never think about this as a problem; they just use it. In fact, without the earth-year, there will be no seconds. The result is that, without knowing it, when our second is being used in reference to other frames, time is being distorted, and that may be affecting studies of the quantum. There is another problem: how do you recognise what is another frame?

You need a Meridian-type point to create tine in units to accord with the internal sense of time as duration. That is the basic requirement for creating something like the year, a basic unit out of which all other units are derived with points or mathematics so as to have time in units----for all usable time has got to be in units. Time is always 'how much time'. For

[98] This is not justifiable because the sense of duration alone is not enough as time. We should seek a Meridian-type point to establish units of time and link them to the sense of duration in the mind. Is that possible in a general relativity metric? I don't think so.

[99] What of the ds^2 formula carrying time with all space, even in general relativity, and by which time travel becomes scientific truth?---a question put to me by one mathematician in his capacity as a journal referee. In fact, it is religious humbug. Unfortunately, due to its mysterious nature, time alone is subject to religious comment, or arrogance. Nobody approaches religious leaders for their comments; they arrogate the right to do so due to the strange nature of time. Now, the ds^2 formula does not carry time with all space because Minkowski was wrong. Time is not implied in all space to curl with it indefinitely. Time dilation is also not a mystery because by the theory of frames the travelling clock is in a different frame: those travelling with it will notice no difference in its performance; those outside will notice the aberration because they are in a different frame.

example, when you go to sleep time will pass by silently; you would not know it was passing by in units. But on waking up, you would have to have time in units to know how much time has elapsed; saying something like 'time is gone' makes no sense. You have to be able to tell how much time is gone. So time in units is what we want to account for. It is the only usable time, which, therefore, gives it a scientific status. If a line or point like the Meridian cannot be placed in any metric, that metric cannot have its own time. And it is wrong to transfer earth time to it. The logical reason is that by its own meridian-type line, its units *will* (not that they may, but definitely will) be different. I call them different periodicities.

In a situation where time units are not universal so that the second cannot have universal validity, as we now understand in our post-relativity world, speaking of time in any metric without its own inherent time units is fraught with difficulties, and probably best avoided. This unrecognised error has been the instinctive transfer of earth time to general relativity---but that violates the principles of special relativity, because it is a process of assuming that the second, or any unit of time, is the same everywhere, or can be applied "without ambiguity" to other parts of the universe. As I have already pointed out, it also violates the principles of frames, as general relativity is a different frame.[100] It implies that there is a universal now when, in fact, there is not, or cannot be, such as will cover all metrics known and unknown with the same time as we have on earth.

The insight that time is known only in units was crucial in developing this theory. Thanks to that insight, we now know that time is in units only, that being so, every body's units would be different from those of the earth. Obviously a meridian-type point on Jupiter will give different time units,

[100] It should be noted that the term "Universe" under relativity is used to cover all other worlds (or frames), apart from one's inertial frame or habitat. This is what makes the theory of frames interesting: what applies to the universe applies, also, to every other (different) frame---at least in so far as time is concerned.

since Jupiter is larger. The year there may be longer or shorter; dividing it down in the way we sub-divide the earth-year to get our seconds and hours, would give units of time completely different from those of the earth.

In the case of general relativity, the simple reason why it cannot (ever)[101] have its own time is that in a situation of continuous acceleration it is virtually impossible to know what is direction: straight line, permanent point, forwards and backwards, up-and-down, to-and-flow, reversible and irreversible motions, so as to determine time as 'the irreversible passage of existence; for the existence itself is problematic. Nobody can imagine the sort of time a general relativity metric will have. Bertrand Russell's pithy expression of the situation in general relativity is the best, namely, "From the sun's point of view, the tram never repeats a former journey."[102] The concept of 'a Creator' does not apply here, for the Creator would have no habitat, nowhere to live, except on a planet or an inertial frame. The state of perpetual flux in general relativity makes it virtually certain that nothing can be discovered there; it appears that there is nowhere anywhere except in an inertial frame. (This is what makes Einstein incomparably great.) But once you find yourself in an inertial frame, all efforts to study the general relativity metric by means of mathematics will be futile because positioning is impossible there. You cannot place any point anywhere in general relativity. "All the old apparatus of geometry---straight lines, circles, ellipses, etc.---is gone" (Bertrand Russell, *The Analysis of Matte*r, Ch. VI.)

The sun is in a general relativity metric; there are even suggestions that it is in a black hole already. What applies to

[101] The so-called interpreters of general relativity base all their suppositions on the Minkowski space; the question is, do they know that even Eddington warned that *the illogical status* of the theory must never be overlooked?

[102] This is because the time co-ordinates would be different. And in a situation where time is part of physical reality (as in the 3+1 formula, not as it is in the Minkowski theory), a change in time co-ordinates means a change in physical reality.

the Tram applies equally to time and everything else---i.e. the act of determining the irreversible passage of existence is impossible in a general relativity metric. Carrying earth time in the head to the metric of general relativity is a violation of the Einstein theory of frames. You cannot place a permanent point anywhere, for there is no 'anywhere'. As Einstein put it in his Encyclopaedia Article: "…Now, what is the meaning of the concept 'space'…? In the present article we are concerned with the meaning of 'where', that is, of space. It appears that there is no quality contained in our individual primitive sense-experiences that may be designated as spatial. Rather, what is spatial appears to be a sort of order of the material objects of experience…"[103] The situation is even worse in general relativity.

The common practice has been that scientists speak of time because they have notions of time in their minds.[104] But that is bland duration. *To have time in units you have got to use some external features of the earth, which therefore makes the resultant time limited to this inertial frame only*. When the process of inventing time as space-time or local time is completed, we get time in the clock; and time in the clock is limited to this planet alone. Again: "There is no longer a universal time which can be applied without ambiguity to any part of the universe; there are only the various 'proper' times of the various bodies in the universe."[105] In this sense (of the

[103] Encyclopaedia Britannica, 13th Ed, 1926/27---see under Space-Time by Albert Einstein, p.105. The passages are not quoted here in direct sequence as he originally wrote them.

[104] If they had come from outer-space, they could have no idea of our time to carry it instinctively to the study of general relativity.

[105] Bertrand Russell, *ABC of Relativity*. Ch. 5. This has been quoted several times in this book because it is vitally germane to my arguments. The general public, logicians, mathematicians, philosophers and scientists still behave as if there is such a thing as universal time. The very theory scholars are using employ the Minkowski invocation of time by mathematics that implies that there is universal time which can be invoked with mathematics. *In fact, local time, as space-time, is created locally, otherwise it is not local time*. It all chimes in symmetrically with the idea

time we have), it is not true that as one gets closer to the speed of light time slows down to zero, so that you could travel round the cosmos and return many years younger when those you left behind were drawing their pensions. The clock you travel with will look slow by comparison with clocks you left behind, but only to observers outside your travelling vehicle simply because they are in a different frame. The clock you are travelling with will seem normal to those travelling with it in one vehicle. How therefore could you travel round the cosmos and return to find that, because time had slowed down, the people left behind are aged more than yourself? What logical mechanism could achieve that? The travelling or speeding clock could in no way control all time; it would merely perform its own functions, rightly or wrongly. It will have no connection with other clocks, let alone all time. Neither could it control the traveller's ageing process. I believe that, of all the myths and legends relativity has spawned, this is the most fatuous. In the absence of a universal time, as Russell has observed above, what possible mechanism could there be for making one clock capable of controlling all time and ageing?

(x) I come now to the origin of space-time specifically; this will be necessarily a brief resume because it has been mentioned all through this book. First, I wish, if I may, with the reader's indulgence, quote again the Russell judgement about space-time with which I began this book: "I want to convey to the reader what is involved in the new phrase 'space-time', because that is, from a philosophical and imaginative point of view, perhaps the most important of all the novelties that Einstein introduced".

The Space-Time notion was originally borrowed by Einstein from H.A Lorentz, who called it 'local time'. However, Einstein stated clearly that it should be regarded as ordinary time, pure and simply: "All that was needed was the *insight* that an auxiliary quantity introduced by H. A. Lorentz and

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of time being 'a construction', as Russell put it, and also with the Einstein theory of frames.

denoted by him as '*local time' can be defined as 'time'*, pure and simple…Five weeks after my recognition of this, the present theory of special relativity was completed." (My italics.)[106] Local time, as space-time, lay at the foundation of special relativity. It goes back to Michelson and Morley and the Lorentz Fitzgerald Contraction. Physics can only properly be understood, and advanced, through historical records, for otherwise you would be creating a new subject, a new physical reality----not even Einstein could do that. Lorentz said he did not discover special relativity because he failed to take the concept of local time serious: "The chief cause of my failure was my clinging to the idea that only the variable t can be considered as true time and that my local time t^1 must be regarded as no more that an auxiliary mathematical quantity."[107]

In other words, when Einstein regarded local time as 'time, pure and simple', he discovered special relativity. This is very important. Lorentz is saying he did not discover special relativity because he failed to accept that local time might be all there is of time, for that is how Einstein regarded the event to be able to discover special relativity. Having made time a separate and independent co-ordinate, to add that it is always somebody's local time because general or universal time did not exist was the moment the world we live in changed to be the world of Albert Einstein, for which reason I think our philosophies henceforth will be footnotes to Einstein, rather than Plato.

Unfortunately the serious implications of his ideas have not, so far, received the attention they deserve because of the Minkowski distortion. Let me stress, again, that we know of the mathematics involved. It amounts to the fact that if time

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[106] Quoted by Abraham Pais in his biography of Einstein, entitled, "*Subtle is the Lord…*" Oxford, 1982. The original sources are given in this book's exhaustive References.

[107] Abraham Pais, Ibid, Ch. 2., 6&7----I tend to prefer this book because Professor Pais gives almost all the original sources, which, for purposes of space, cannot be cited here.

can be shown to be naturally part of space, then we do not need to add it as a separate and independent co-ordinate to space as Einstein originally proposed. But if the formula to make time part of space is fictitious and arbitrary, and yet is still relied upon, then relativity is being distorted. That is the gist of my argument.

Local time is the time of your own making, otherwise where does the time come from when it is supposed to be 'local'?[108] How local time is created is precisely how we create our time for this inertial frame—i.e. by counting external repetitive cycles as years, and further sub-dividing the year, as one unit of time, into the other smaller units of time all the way down to the seconds, and so forth.

To recap, Einstein found that there is no other time. Local time may be regarded as 'time', pure and simple. The implication is that time is created as 'relation between points'. Thus Russell could state that "There is no longer a universal time…" And everybody knows that Einstein said there are as many times as there are bodies.

In another short digression, we may note that it is the basic proposition of his special relativity, namely, that the universe is not one coherent body but consists of numerous sectors, each with its own set of natural laws. This, in essence, is the famous Einstein theory of frames, whereby the earth is known

[108] Many writers and scientists (probably all scientists) take this to mean, "The local measurement of time". That there is time naturally in the cosmos, and we measure our local version---a recast of the old religious notion of time. In fact, local time requires the total abandonment of cosmic or universal time---that is to say, time is not running all through the cosmos. There is no time. We manufacture (or construct) our own time locally. Thus inquiries about how our time began are, from my point of view, very important. For, I repeat, the Einstein theory does not mean "the local measurement of time", that is, of some kind of naturally existing time. It means precisely what Bertrand Russell said: that cosmic time is abandoned, and time has become 'relation between points'---sentience is required for the having of this time, otherwise we have only multifarious existence of myriad of objects each persisting by its own chemistry, which is what we refer to as 'existence', but it is different from time.

as our inertial frame. In our case, for the earth, he gave us the two postulates for our natural laws. Naturally, therefore, time and space are (and have to be) different in different frames of the universe, because they will have their own different postulates. Thus some writers say, according to Einstein, there is no such thing as 'a universal now' anywhere in the universe; and I believe they are right.

It is interesting that Einstein arrived at this theory by using the Lorentz concept of local time. Lorentz was also honest to admit that he was wrong for not taking the local time idea seriously. But all this concerns only special relativity. Einstein had two rare brainwaves: one was the theory of frames. The other was that gravity is not 'a force' but arises from the curvature of space---caused by the presence of mass or massive bodies. This is known as his general theory of relativity. For our immediate purposes it is the idea that every frame should have its own natural laws and time that is most interesting, because, as far as I am concerned, general relativity hasn't got its own time, yet it is a different frame. Cosmologists transfer non-existent 'universal now' to general relativity illogically.[109] Thus it may very well be that most of the work they have done in general relativity is vitiated by the confusion over time, especially because of the Minkowski ict equation. But I cannot blame them, for man is never free of the sense of time thus making its logical analysis very tricky; not many of us can decipher time strictly logically without resorting to a notion of time that is something like a universal or ordinary time as they have learnt from childhood.

My general impression is that the Minkowski theory makes sense to scientists because they think local time means "the local measurement of time", implying that time is the same thing as being, or existence, and we measure our local versions. That is the difference between those of us, like

[109] For example, how do mathematicians create the second in general relativity? The simple answer is that they don't---they just use it, which is wrong. Because the second is not definable on its own, you cannot create the conditions or circumstance for its existence without the earth-year.

Russell, who think we understand relativity proper, and all others, including most scientists. In fact, time as local time means it arises as relation between points in a locality, and that there is no such thing as cosmic time. It is in this sense that its passage, its continuity, and its perpetual nature can be logically accounted for, as well as providing time in units, like the earth-year, to enable us to mechanise it into a clock. The principal test of a scientific theory is that (normally) it answers all related questions, as this Einstein theory of time does. Otherwise the passage and continuity of time would continue to present mysteries no one can explain.

NINE

Earth time, the quantum, and general relativity

The strange story of the quantum is also the most interesting story in all science, from chemistry to geology, astronomy to cosmology, and physics to botany.[110] The quantum is regarded as the greatest of all scientific discoveries.[111] And the general feeling in physics and astronomy is that the quantum has got to be linked to the metric of general relativity to complete our knowledge of the external world. Researchers want to link gravity to the other forces and particles known to exist by the Standard Model.

On the contrary, I argue that the metric of general relativity is not *part of our inertial frame where the quantum is known to exist*.[112] We do not even know what the metric of general relativity is really like apart from being 'highly' gravitational, which means continual acceleration. We have got to establish

[110] There is even a whole book by this title, "The Strange Story of the Quantum", by Professor Banesh Hoffmann.

[111] I personally believe that it is the greatest of all human discoveries in science and everything else as it shows the true nature of what the external world consists of, namely, light energy in various combinations, creating the atom, which in turn, also creates bulky matter through various chemical combinations, and so on, all the way to the creation of man as "the accidental collocations of atoms that had no prevision of the end they were creating"---including the Hitlers and Stalins, but also the Einsteins, Newtons and Shakespeare. Another miracle is that it was Albert Einstein, not involved in its original discovery, who made it really scary by extending it to all matter and all energy; so now we know that anything is just a bundle of so many billions of quanta congealed into specific forms of matter. And let me repeat that the Einstein theory has been proved with the photoelectric effect.

[112] The metric of general relativity is supposed to be permanently gravitational.

the nature of the general relativity metric, settle it in concrete logical terms and cued into our knowledge of the external world, before the question of whether or not it can be linked to the quantum is even considered.

The existence of the quantum is not a theory; it is a fact. QED is said to be the most well-established of scientific theories.[113] QED means "Quantum Electrodynamics", or how the quantum interacts with matter at various levels of the electron's existence and activities. Above all, we see the quanta as light, the particles of light; so we know it has real, physical, existence. But the existence and actual nature of general relativity can only be assumed. Are we sure that the quantum can exist there? If so, why is the black hole so black that we think light cannot escape from there? *It may very well be that light does not exist there, because the quantum may not be the same there as it is here on earth*.[114] Our quantum relies on a time component that comes from our peculiar time system, a time system that obviously cannot exist in the metric of general relativity in exactly the form we know of it here on earth. I think the nature of the metric in general relativity will have to be settled in concrete logical terms before we can even know whether the quantum can be linked to it.[115]

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[113] "Quantum electrodynamics is arguably the most successful scientific theory there has ever been…", *New Scientist*, 8th Jan. 1994.

[114] I don't think it can be the same because of the time factor. Despite the fact that relativity has been with us for a hundred years, the inclination to treat time as if it is the same everywhere dies hard. Once we regard time as 'a construction' as Russell called it, it will be realised that it might not be constructed exactly like ours in other places, especially in the strange metric of general relativity. And there is the question of who will be there to do the construction, too. Yet the truth is that without the 'construction' the can be no time---just living and dying, for all things, in the end, will die or suffer metamorphosis. The notion that time can pass silently is based on the concept of ageing, but it is wrong. Ageing and all motions are caused by chemistry not time such as can be mechanised in a clock. But once the time has been 'constructed', it can be applied to all motions, including that of silent ageing.

[115] Whatever uncomplimentary things scientists may say about philosophers in anger, or due to ancient prejudices, they should never

A quantum of energy consists of so many parts of energy and so many moments in time.[116] It may be the smallest bit of energy than can exist by our time; it may not be the same unit of energy and the same fraction of time somewhere else. Our time is not universally applicable. Our time is uniquely our own, based on the orbits of the sun by the earth. From that we get the year; and all other units of time are derived from the year as sub-units thereof. It must never be assumed (without proof) that the units of time required for the quantum to materialise on earth will be the same everywhere else, or that other metrics will have their equivalents in the currency of their own peculiar time systems---we have absolutely no logical grounds for assuming that it will be so.[117] For a start, general relativity has no time of its own; cosmologists have been falsifying their suppositions by using the Minkowski space, because they believe (quite wrongly) that the ds^2 formula is basically a description of space, and all space is the Minkowski space of 4-Dimensional geometry.

We often hear that every attempt to link the quantum to general relativity meets with insurmountable mathematical roadblocks. I suggest they may not be roadblocks as misconceptions in the very theories used in the interpretations of the metric of general relativity, particularly misconceptions

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ignore the fact that those of them who write on logic and technical philosophy dealing with physical theory (or physics and its metaphysics) are very professional and technical, working by strictly rigorous deductions consistently as if they were mathematicians, sometimes even more so. Nowadays most technical philosophers are also competent mathematicians. There are lazy people who are afraid of mathematics; but really it is not that difficult.

[116] There is no need to cite the precise figures as they are not in dispute; besides, they keep changing.

[117] In other words, it cannot be supposed that the quantum can appear in other metrics, but only the time components will be mathematically different from ours; for the problem with this idea is that time means ‘a union between the sense of duration and external cycles’---sentience and the intellectual use of points are required, thus there can be no time in metrics without ‘Beings’, as in the metric of general relativity, or a gravitationally strong black hole.

as to whether or not all space is 4-D geometry.[118] The quantum is not changeable, but the suppositions about general relativity are fickle. And the time factor, too, is changeable. Pure mathematicians operate by always conceiving imaginary quantities and properties as Eddington himself has pointed out; so the fault may lie in their imaginary suppositions about the nature of the general relativity metric.

To my mind, the most scary thing about the quantum is that we see it as light; without light we cannot see anything at all, and the quanta are the particles of light: they are all light consists of. *To say something is the particle of light is one thing; to say something is all that light consists of is quite a different proposition*. So it is the quanta we absorb to see objects, since we never perceive the things themselves direct visually. When it is said that we see only the surface qualities of things, it means we see only the reflected or radiated lights of things---as woven by the quanta emanating form their surfaces. Of course, we still have to have light to see things. But we understand from Quantum Electrodynamics that the lights from a light source are absorbed by objects on contact (as received energy), then the objects would, instantaneously, emit their own lights in exchange as their electrons jump upon receipt of the incoming energy, radiation, or light. This is part of Quantum Electrodynamics, generally said to have been proved beyond doubt.

And what is the status of visual perception in the scheme of human knowledge? "As physics has advanced", said Russell, "it has appeared more and more that sight is less misleading than touch as a source of fundamental notions about matter."[119] Since the whole of mathematical physics is the study of matter, the importance of sight as the source of our

[118] If it is true that the Minkowski formula is arbitrary (that is, in plain language, false and contrary to logic), then the interpretations would be flawed, since they are based on the Minkowski space. To my mind, the most farcical theory in science is calling the Minkowski formula "Minkowski Universe"---even though it is arbitrary, and therefore untrue?
[119] Bertrand Russell, *ABC of Relativity*, Ch.1.

knowledge about the external world is obvious. There is brewing a major scientific debate or confusion (and especially for me, a frightening one, harking back to Neils Bohr's dictum to the effect that whoever is not shocked by the quantum theory has not understood it.)

We are told on the highest authority that, on experimental evidence, nothing can be seen except its lights radiated from its surface in the form of quanta of energy. As I have argued above, this alone is of momentous importance, because it is enough for the refutation of the Platonic theory of Ideas, no mean achievement, provided mankind will have the courage to dispense with the Platonic Idealism with its implication for the existence of God, and look at visual perception in purely physical terms--- which means that images are constituted by the quanta flying off the surfaces of objects with their exact forms.

Since we have to be able to absorb the actual lights form objects to see them (so that if a light from an object is not directly absorbed its image cannot be perceived), it is obvious that visual perception is *the absorption of quanta*.[120] That is our process of seeing the external world. So the quantum is even more mysterious than Neils Bohr's statement implied. And there are more puzzles and quandaries. I am thinking of the quantum's zero rest mass; why the quantum as opposed to any other unit of energy; tunnelling; why it is seen as light, and does that confirm (the apparently bizarre supposition) that there is no illumination in the universe because the quanta are naturally coloured? If I were a religious person I wouldn't worry about the quantum's scientific credentials. It can be used to prove any proposition in cosmology or cosmogony. The one inescapable fact is that it is seen plainly as light.

What about the quantum's velocity via light's wavelength while remaining corpuscular---I mean the dual nature of the

[120] This clumsy phrase and many others like it in this book have all been part of numerous technical papers to the journals that have been rejected, hence the facility with which I can use them. I am having the last laugh!

quantum, and so forth. How can we link this mysterious particle or particles to general relativity? Yet the metric of general relativity is *mistakenly* based on the Minkowski concept of 4-Dimensional geometry, which is said to give us the Minkowski Space, or Universe. If Minkowski is wrong then the whole of the interpretations of general relativity have gone astray, distorted. Valuable time and resources have been spent thinking about something that does not have any real physical existence. Yet mankind was given sufficient warnings by Professor Eddington, Professor Whitehead and our great Bertrand Russell, no less.

Here is just one small example, which I am repeating again. The Encyclopaedia Britannica claims that, "…practically all cosmologists have *assumed* that space-time [the Minkowski version, mind you] is infinite in its timelike directions." (My italics.) *May I remind the reader that the space-time mentioned is the Minkowski version which has been described as arbitrary; but because Einstein adopted it (albeit under duress!), everybody is afraid to criticise it. Part of my difficult in writing this book is that even those who have criticise it also used it---Russell and Eddington included. So I am having to repeat so many points for emphasis.*

But how can space-time as the discrete (and fictitious) creation of mankind be infinite---what about its essentially discrete nature? (I want the reader to remember that, by its very nature, space-time is necessarily discrete.) There, again, what about the fact that time, as space-time, is a construction? Also, since the word 'timelike' is one of the new terms introduced by Minkowski[121], it means the cosmologists have been misled---that is, if the Minkowski theory is fictitious as we have been told. So we know that the quantum is real; we see it every day, indeed it seems we cannot see anything at all except its quanta in all acts of looking at the world. But the nature of time in general relativity, as the Encyclopaedia states, is only assumed. How can we link something that is physically real

[121] The opposite is 'spacelike', both were originally introduced by Minkowski.

with another object that is only assumed to be so-and-so, as pure mathematicians are fond of doing?

As Einstein states, "Consider the concepts referred to in the words 'where', 'when', 'why', 'being', to the elucidation of which innumerable volumes of philosophy have been devoted. We fare no better in our speculations than a fish which should strive to become clear as to what is water…"[122]

Let us consider 'when' in isolation. How do you determine 'when' in general relativity without borrowing from the sense of time used on earth? I don't believe that this is done unconsciously. The cosmologists have no other sense of time but the sense of duration we all feel in the mind, which is only part of time as we use it on earth. To have quotable, external time that can be used culturally (not just in the imagination to suit imagined properties), you require external cycles to be joined to the internal sense of duration.[123] This cannot be done in the metric of general relativity because of the continuous acceleration there. Yet we have to have time in general relativity, using earth time there is not logically acceptable. In short, we want to link general relativity to the quantum; but the quantum is based on time, and how do we get time in general relativity, since we are logically prevented from using our earth time there?[124] Let me stress that special relativity is based on the Einstein theory of frames. By this theory we are barred from using earth time anywhere else, as Russell put it, "without ambiguity".

Everything in general relativity is vague or merely assumed in the fashion of pure mathematics. The only certain knowledge we have of general relativity is that it is caused by the

[122] Einstein in his Encyclopaedia article on Space-time, Op. Cit. p105

[123] This, after all, is feasible because time requires points, and the mind is used to them since duration also requires points---i.e. for the beginning and the end of any event.

[124] Taking the quantum which is only established with earth time to apply to the metric of general relativity is logically untenable and completely mistaken. You need general relativity's own peculiar time system to determine whether the quantum will be the same there as it is on earth.

curvature of space, which results in a metric of perpetual acceleration. As a distinct frame on its own, such as our special relativity inertial frame, as the earth, is on its own, general relativity is without a method for the placing of points for the having of time as 'relation between points', and link it to the sense of duration in the mind---to result in usable and quotable time for the clock. To assume, as Professor Bernstein mentioned above, that the metric has four co-ordinates, is to represent time with a single co-ordinate in general relativity as we do on earth in the 3+1 formula. *This amounts to copying from earth time.* However, that is not applicable to the metric of general relativity as it is a different frame altogether. Instead of researching general relativity to find answers for these vital questions, mathematicians and cosmologists have gone to sleep on the assumption that the Minkowski formula provides all the answers, and are thus shooting ahead with the multiple dimensions of mysterious space by way of the Minkowski ict equation. I believe they are sadly mistaken; and so long as these questions remain unanswered, I don't think we can ever link the quantum to general relativity.

TEN

Legends and myths of time

(i) Here we have to go into some details because this is the crux of the whole problem of time. Time is different to different people, culturally, religiously, scientifically (because of Minkowski), and logically. The task is to find one definition of time acceptable to everybody, which we can defend in logic, show how it passes, and why it is perpetually there. Instead of merely assuming that time just exists in nature (as discussed in the previous sections), and that local time means we measure our local version of time with our mathematics, we are rather invited to consider it as relation between points. The time remains the same. The reason Minkowski got away with his fiction is that (on the planet), the second is always the same; but under the alternative definition we are given clear logical explanation of how it begins, how it passes, why it is continuous, and at the same time show how it is linked to physical reality consistent with the laws of physics, thus leading to a new conception of nature.

Time was wrapped mainly in legends and myths until Einstein's space-time concept; it means logically or rationally nobody knew what it was before that. As far as we were concerned, time was in existence and we just used it. The small number of poets and philosophers who felt able to discussed time contradicted one another so that in the end everybody just used time as it was. But what was it? Or, what is time? Nobody has ever defined it other than assuming that we measure our version of it. In the words of Professor Eddington, "Prior to Einstein's researches no doubt was entertained that there existed a 'true even-flowing time' which

was unique and universal…" And he concluded: "Those who still insist on the existence of a unique 'true time' generally rely on the possibility that the resources of experiment are not yet exhausted, and that some day a discriminating test may be found. But the off-chance that a future generation may discover a significance in our utterances is scarcely an excuse for making meaningless noises."[125]

This is as strong a condemnation of those who rejected the Einstein theory of time as we are likely to get, and Professor Eddington was one of the mighty pillars of the scientific establishment; above all he wrote this in his *Mathematical Theory of Relativity*![126] The statement had to be that strong because even still now scientists believe that local time means our local measurement of time, implying that there is in existence some kind of universal time of which we measure our own---that is the main reason they accept the Minkowski formula as correct.

We are thankful to Professor Eddington; and must stress again that, as a matter of fact, it is a surprise that scientists still think 'local time' means our own local measurements of time. Yet that makes time universal of which we measure our version. And this is where Einstein comes in. By his researches, as Professor Eddington avers, time becomes dynamic not absolute in the Newtonian sense. It is changeable under different conditions; it is also changeable from space to space, which means from point to point in theory and also in mathematics. The most logical interpretation of this definition of time is 'relation between points' in conjunction with the sense of duration in the mind. Each point is given duration in the mind: thus it can be a year or a second. But that makes time pragmatic, because the year, as the basic unit of time, is just one orbit of the sun. The units of time are man-made, but

[125] Professor Sir Arthur Eddington, Ibid, Ch.1.1.

[126] The irony is that Professor Eddington failed to realise that the Minkowski theory he was using, and stressing that they shall continue to employ it, leads direct to the same interpretation of time he was castigating so strongly.

the time seems natural, because it is linked to the internal sense of time which we experience as duration in the mind.

Space-time is strictly discrete. Even without going into the logical and philosophical suppositions of how time comes about, everybody knows that one year ends, and another begins; that is the practical view of time; this particular notion of time is neither religious nor scientific. That is what one aspect of time is in practice. Before one year there is nothing. After one year we know that another year is coming, that owes nothing to the previous year---just like Christmas. One festive season ends, and another begins and will come along at the end of the year, owing nothing to last Christmas, except perhaps some decorations put away for another use, not necessarily as miserly economy. Nowadays we are urged to do that (reuse things to save the planet, which applies particularly to the rich who can afford to throw a lot away; since they consume a lot; they are urged to re-use things not as acts of parsimony---we know they can afford it---but to stop or at least delay Global Warming.)

Logically, the last year owes nothing to the next year simply because there are no logical, physical, or conceptual links between the individual years. The last year has to end completely before the next year can begin. That is what time obtained from space with points has to be, essentially discrete. The rest of our units of time, also derived from the year with points as the sub-divisions thereof (from the seconds to the hours, weeks and months)[127], consists of individual units unrelated to one another. As Russell pointed out in his book *Mysticism and Logic*, there is no such thing as the next moment. The next moment is not 'next' to any thing; it has no links with any other moment of time. It is entirely on its own. Discrete units of time owe no allegiance to one another. No links with the one before or the one after.

[127] We do not just give names to natural units of time as some people suppose. The hours and seconds would not exist without us. The names of our time units include their modes of acquisition and provenance---i.e. as parts, or fractions, of one basic unit, the year.

With this in mind, let us consider some of the legends and (just a few) myths of time, as Professor Eddington has said, before Einstein.

(ii) First, we need to be absolutely clear about one thing. It is this. The sub-units of the year are directly part of the sum total of the year, so if one second is removed the year runs short---that is, one second before mid-night on December 31st is still this year, not next year. This was amply demonstrated during the recent euphoric world-wide countdown to the Millennium, in which even Monarchs and Presidents (scrupulous and godly, corrupt and despotic alike), took part, counting the last seconds to the beginning of the new Millennium. If everything stopped just one second to the new century, there would have been no new year to mark the occasion. Luckily, The Satan absent-mindedly overlooked this golden opportunity to dramatise his aim to end the world and allowed things to move on probably by default not consent.

The units of time derived from the year with points are each individual and separate. This means each unit of time occupies an amount of space out of that traversed by the earth round the sun. A second is equal to a certain amount of space, like any other unit of time. So the second is not a mere mathematical unit, but a real physical entity. We can calculate the amount of space it represents out of the total space traversed by the earth round the sun.

(iii) Among the legends and myths of time too numerous to list here, I have selected just a few for comment, some of which are very brief indeed. First, we hear of 'measuring time'. Even Russell put the question, "if cosmic time is abandoned, then what is measured by a clock?" The simple answer is that the notion of measuring time arose out of the ignorance of the true nature of time as discrete and unrelated units based on the sub-division (with points) of the earth-year. *If time is a construction, then it is not measured*. The notion that time is measured and the idea that time is absolute or general (that is that it is universally existing in the cosmos and the same everywhere), derive from one concept of time that

ultimately attributes it to God, or nature. Even under relativity, it is supposed that we just measure our version of time for local use as our 'local time' in answer to the Lorentz discovery of t^1.

Rather we now think that time is constructed in units, all separate and individual; the old idea of time running all through the universe like a thread is no longer tenable. *Time is the passing units of it, that is why Professor Whitehead described time as a single moment; it goes on because we repeat the units or moments over and over again perpetually.* This is the great ironic sense of time under relativity. Let me stress it to be absolutely clear to the reader because it is interesting---the most interesting aspect of time as revealed by the Einstein notion of time. A discovery equal in importance to the Platonic 'Simile of the Cave'. It is this: if the unit is the time cycle (that is, if the year is a unit or moment of time), then the passage of the units demonstrates *the physical passage of time* for which man has been searching for so many thousands of years.

But we must not get carried away and suppose that time is purely physical, since the cycles contain the sense of duration felt naturally in all mankind---perhaps in animals too! Otherwise the mere physical cycles make no temporal sense, which is the fate that befell (and vitiated) the Minkowski intervals. The second, as we know of time, is gone as it occurs, so do the hours and minutes, even the years; they are passing---all in specific units. The great human achievement (perhaps his greatest) is creating the time units to make them pass in succession to show how time is passing. In this the regular orbits of the sun by the earth was a great help.

Secondly, we hear that time is marching on---from its beginning (as Time Zero), to the end of time, which is supposed to be the day God decides to call the whole thing off. Yet discrete time does not march; it cannot march. By the same token, time has no history. What have history are the events to which specific time units are associated; otherwise the units of discrete time do not last to have history---as the

year is completed, it is gone. Also, like all units of time, as the second sounds, it is gone. That it is 'a second', a distinct time unit known to us as part of our time, is the greatest puzzle in the world. The mystery of time surpasses all other mysteries, except the origin of life itself, but that is not part of life's mysteries; it belongs to the interpretation of the cosmos, or the theory of cosmology.

At the end of December 31st, as the journey round the sun reaches a year, the year is gone, so how can it have history? Discrete time has one advantage, though. It duplicates its constituent units to continue, to make time seem continuous. Our time consists of one year at a time. This is incontrovertible; you cannot go beyond one year; and when you count any time unit backwards too, you can only end in a year. To get more years we simply go round the sun again. All the other units of time obtained from the year are also individual and unrelated to any other units, not even to the year itself. They would not exist without the year, of course; but they are not its offspring; they are mathematical sub-divisions of it for our convenience only.

(iv) Naturally, the question arises as to why we have had history, such that we can trace events from several centuries back---yet that, precisely, is the point. We trace *events* back, and associate the time of the events with them. We do not trace events *back in time.* We merely trace the events' own antecedent back with their associated times of occurrence. The Second World War ended in 1945 (at least in Europe.) We can trace history back to that date; that means tracing successive events from that date to the present time; it is not correct to say time has been marching on since then, because the successive years were all separate and individual and bore no relations to the others. This means that, in a very technical sense, history is part of the process of having time, or creating time. The reason is that history is 'a recall' of past events; it is part of the memory mechanism; recorded history is a continuation of oral narratives. This memory mechanism consists of the retention of past events, the sense of things and events lingering in the mind; and it is that same mental

apparatus we use for time. Time belongs to that process because it is an act of counting external cycles to determine how long (how many cycles) the events recalled in memory lasted. It is correct to add futuristic considerations because the cycles can be broken down and used mechanically (i.e. in a clock), for the cycles are not always those of current cycles; they are not always cyclical either.

The year is a cycle; but it can be sub-divided down to seconds; these seconds are part of the yearly cycle, after all they represent a certain amount of the physical space traversed within the year. A second is part of the cycle that gives us one year, therefore, theoretically, it is also a cycle, or it belongs to a cycle. Once mechanised in the clock, and because it is recurrent and continuous, the individual time units can be used forwards for planning, and backwards in historical analysis. Actually we usually overlook its cyclical nature and just call it 'time by the clock' ticking away the seconds in separate units. It is when time is used backwards that problems arise, because it then looks as if it is the time we are tracing back; but in actual fact only the physical events can be traced back as they are deterministically caused. Time, on the other hand, is not subject to determinism; a second is gone as it occurs; the next second is also separate---the same process applies to all time units, from the year down to the cesium units.

(v) *Why can't we have years continuously in nature and rather have to repeat every year for time to continue? Obviously the simple answer is that time is naturally discrete. Of course we have had the years following one another for centuries, but it never occurred to anybody that it is the basis of the passage and continuity of time. Yet the discrete nature of time is proved by the years---which, in turn, confirms the Einstein theory of time as "space-time" derived from space (like the years) with points.*

Sometimes, writers speak of the being of things. But the being of things is one thing; time is another. Things 'live' out their life spans. There are billions of objects, yet that is not the general 'being of things' because they are not all existing in

one fashion. Everything lives its own life; but while that can be called 'the being of things', they are so many and different (disparate) that we cannot use all of them for time that requires repetitive movements; and without that condition, which of them can we use for time? None whatsoever. So 'the being of things' is not the same thing as the 'being of time', for time is always 'how much time', or mathematically quantified time.

The lives of things and people started moving on from their inception, like the passing years, it is true; but that does not mean time is the same thing as the general existence of objects, because the years were not invented until very late in the life of this planet. Quantified time could only have started after we acquired knowledge of arithmetic, and further learnt to count the orbits of the sun as 'years', with the mathematical ability to sub-divide the year into specific units of time for cultural purposes.

The situation would be different if all things came into being at once and began moving on at the same rate to the same end. That would mean the being of things is marching in tandem with time. But as things are regularly coming in and out of the world none of them can be said to be carrying time for the rest of us by its ageing process. Even the earth is not carrying time for the rest of us, because we can dispense with its orbits and select another object to fulfil the same purpose. We can, for example, use our hypothetical school boy to go round and round the Cathedral, and count his cycles as our rates of time. If he got tired, we could use something else, say, a mechanical device.

(vi) Another favourite of thinkers of religious bent is 'The Beginning of Time'. In fact, it is the beginning of the events of history as explained above; alternatively, it may be said that it is the beginning of Existence, tracing events far back to first causes.

Nevertheless, although time is based on Existence, they did not begin together. For eons man lived without knowing how to mark time. Nobody can say how long it lasted because there was not years to mention. Even when it began, many primitive

people used sunrise and sundown for days and nights; and counted the moons (quarter, half, and full moons) for the years. Still now some primitive villagers in Africa and Asia mark time by shadows and tally marks in charcoal on their walls for days and months. The weeks and days and the rest were cultural in origin. These and all facets of the clock/calendar system help us to keep time as a union between the sense of duration and repetitive external cycles.

(vii) Apart from thinkers and writers of religious bent who still cannot bring themselves to accept that time is not universal but rather a construction in which man plays a part (constructing his own time), we get theories about the beginning of time from science and scientists---or some of them. This is strange, not least because such illogical theories are promoted mainly by mathematicians and cosmologists, sometimes calling themselves "the interpreters of general relativity". It has become clear to neutral thinkers observing what is happening in physics and cosmology since Einstein that the Minkowski formula is being used to propound bizarre concepts, chiefly because they take time as space, and space as time. Hence they have invented another theory for accounting for the beginning of time. They call it "Time Zero".

It means time was zero until the Big Bang---when time began from zero, and has been marching on ever since. I think it was the lovable, intellectually ubiquitous polymath, Bertrand Russell, who remarked that, because of their usually high intelligence, when scientists get something wrong they manage to get it spectacularly wrong; and the main reason they have got the nature of time so spectacularly wrong is the Minkowski 4-D geometry they regard as sacrosanct. All the time the true nature of time in the form of the discrete earth-years was passing before their very eyes, year after year after year---and from which we get all other units of time. Discrete time automatically vindicates the Einstein notion of time. Being discrete, when it stops, it has to start again, meaning it is coming from nowhere at all besides the points at both ends. And the year is re-starting annually before our very eyes---as 'relation between points' at the Meridian.

Thus the Time Zero idea is completely meaningless because of the Einstein theory of relativity, with its concept of local time---i.e. locally created time for local purposes that does not apply to other bodies. It is a surprise that scientists are the people promoting the Time Zero interpretation of time. Sadly it implies that they still think time is universal, perhaps due to the Minkowski formula.

Let me remind these "Time-Zero worshipers"[128] that there is no time on those barren planets without (human) life. There are only the life-less objects existing by their own physical constituents and chemistry. The reason is obvious, but I will spell it out anyway, or, as Russell has said, they could get it spectacularly wrong. Time requires points and sentience: the points to give you your time in units, as time can only be useful in units---from the year downwards. The sentience will do the counting of the years into decades and so forth---somebody must be there to place the points for the determination of the year, and also count the orbits of the sun as years and break the year down to the seconds, or there will be no years and no seconds, and therefore no time for the clock.

Under relativity every body has to have its own time. According to Einstein himself there are as many times as there are inertial bodies, and, as already mentioned, Russell put it in philosophical language thus: "There is no longer a universal time which can be applied without ambiguity to any part of the universe; there are only the various proper times of the various bodies in the universe."[129] In other words (cutting the

[128] Human Beings, being what they are, it will not be long before some people start churches to worship Time Zero, if they haven't done so already, for setting civilization in motion.

[129] I must apologise for quoting this again; but it must be understood that, about time alone, people are pretty stubborn, simply because it touches on theology. So I will probably quote it again and again. I offer the same excuse for all the repetitions in this book. It is a deliberate act; it is not a literary defect; I am aware of them. I am not ignorant of literary norms. My problem is that I do not want to be misunderstood. I know a number of scholars who should know better will be only too ready to concoct interpretations of my ideas to make me look like a sloppy thinker. So I

argument short), we must seek an explanation for how our own time began, for there is no universal time from which we draw our own version, and therefore our time is not "our local version of *time*" of whatever provenance.

The idea that there is no longer a universal time is a fundamental philosophy of existence, and it is based on the fact that our basic unit of time, the year, is discrete. This notion goes deeper than any other theory in life, except the origin and purpose of life itself. It is extremely serious, so serious as to be almost shocking. For it means there is no time in nature given to us free for use for convenience. What time is in use originated from the activities of man himself, locally. The problem is to find out how man managed to invent his time, as any other living beings in the universe would also have created or invented their own time. The answer seems to be that time comes from a union between the sense of duration and external cycles, or mathematical cycles, and, in practice, appears as 'relation between points. The earth-year, for instance, exists only as 'relation between' 1st January and 31st December.

It has to be admitted that some other thinkers and scientists believe that time began with the Big Bang. It is not clear whether they accept the Einstein new idea of time; what is clear is that, if time began with the Big Bang, then it is universal and has been marching on ever since. It makes everything simple for everybody---added to the 4-D geometry, it makes physics easy under relativity; for otherwise relativity is not entirely scientific. This irony is what worries scientists to make them seek salvation from Minkowski.

One consequence is to spare us the difficult task of explaining how our time began, as I am struggling to do in this book, just as I have tried to do in my other works. Yet the Big Bang notion of time cannot be true because the theory that there is no longer a universal time has been proved as well as any

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repeat those things that are in my favour to help the reader's understanding and place on record the concrete justifications for my views so that they cannot be contorted.

well-established scientific fact has been proved.[130] I cite the following logical proofs again: (a) By the Einstein theory of frames, each with its own natural laws, meaning if time varies with conditions (or positions) then it would vary, also, in different frames, for they are different frames precisely because of their varying conditions, or metrics. (b) By Einstein's further analysis of order and simultaneity, proving that time cannot be the same everywhere, such that our second and other time units could be applied to other worlds without ambiguity. (c) By the Lorentz concept of local time which was linked to the time dilation question to the effect that wherever one may be he or she could create 'a local time' for his or her convenience that would differ from time elsewhere. (d) Finally, we re-start out time every year from 1st January---so it comes from our own actions! All these taken together leaves no doubt that time is not the same everywhere, or running all through the universe like a thread from the Big Bang, of which we measure our own version with our mathematics. That old idea of time is now completely inadmissible. It must be stressed that "the one all-embracing time" on this planet has been created artificially with our mathematics and certain features of the earth, which therefore makes it limited to this planet alone.

I suspect a sneaking fear of secular time is responsible for the apparent error of continuing to believe in a universal time. This is the reason the Minkowski formula is promoted by some writers because it is mathematical (which means acceptable), and yet seems to imply that time is existing somewhere (or somehow) that can be invoked universally with mathematics.

Most of the scientists who comment on time are cosmologists and professional mathematicians. It is well known that mathematicians are incurable mystics more at home with theology than logic. For the last time, let me remind them that there is no longer a universal time. Time is a construction.

[130] It starts from the fact that the year is one unit of time; to get more years for time to continue, we go round the sun again.

Sentience is required. Somebody must be there to count the orbits of the sun as years and break the year down to the seconds or there will be no years and no seconds. And how did our time begin?

We know that the sun came into existence long before the earth was formed; and our time is reckoned from our orbits of the sun. So time must have began on this earth after it started to regularly circle the sun. Secondly, since sentience is required, the ability to count was necessary, and a theory of numbers was also indispensable, time for the clock could not have been known before the invention of "The Point", plus a theory of numbers. Some primitive methods of keeping time are known to have been used by primitive man; but a universal, mechanised time for all and sundry on the planet could not have been known before the invention of The Point, or mathematics.

It would seem that scientists accept that our time is our local time. My suspicion is that they believe that there is time, and that our local version comes from that natural time. This view contradicts the canons of special relativity but is in consonance with the Minkowski formula; and since Einstein adopted the latter and even praised its originator, scientists feel free to act as if they believe that time is there somehow as 'natural time' of which we have our local version. But logically this notion is fatally flawed---the year, for instance, has to be restarted to give us time every now and then.

(xix) And so we get theories about the end of time, its beginning having been portrayed as part of 'Creation', whether the term creation is mentioned or not. There is no theory of the beginning of time anywhere that does not imply that it is somewhat providentially 'given', a universal bounty that could only have come from God, and which will end in a religious manner. Well, certainly our time will end sometime in the future purely as a matter of material deficiency---when the earth dies after its parent star, the sun, dims, our time will naturally end in a material sense that has nothing to do with any God. All other proclamations about time are religious and

groundless. They even keep changing: when times are good, people say, hope, and believe that time will last forever, or that it will all end in Heaven for eternal bliss; when times are bad people fear that God is claiming back his planet from sinners. There have actually been frequent human sacrifices including cannibalistic practices (especially in wars), in the hope of saving the world in bad times.

(viii) There are also the concepts of 'Before' and 'After', 'Past and Present', but they require more detailed explanations, as I will try to show. These terms are intimately (but wrongly) associated with people's definitions and concepts of time. In particular, many physicists get their ideas confusedly entangled with them, in my view, needlessly. I would even add 'Order and Simultaneity' to them as being also of no use in the study of time whatsoever. Einstein used analysis of simultaneity to illustrate why time is not general or universal; or that there is not one standard time frame covering the whole universe and the same everywhere.

Other than that, simultaneous events have nothing to do with the process of having time---*they rather use time; they are applications of time already in existence. In the case of the Einstein experiments, the Newtonian general time was in use already. That is what Einstein used; so it is plain that all time looks like general time. The difference is in how they are obtained, in the case of post-relativity time, as local time, or space-time, meaning time that cannot be had without space; so that wherever you are you can create your local time within, or with your local space*.

Let me stress again that Einstein used clocks to demonstrate that time is not cosmic and immutable. The clocks he used were based on the concept of universal time of which we measure our own version with our mathematics. The same or similar clocks are in use today; but our concept of how the time is obtained has changed from one of recording versions of what is a universal bounty, to using points to divide space for our time units---the year, for instance, as sub-divided down to the seconds.

The great problem (or mystery) about time is that it is there when we are born, and also there when we die. This gives the instinctive impression that it runs all through nature like a thread, as a naturally existing entity and permanently there for use. For example, as mentioned above, to analyse simultaneity, you have got to use time; the time was there already. If the analysis of order and simultaneity shows that there is no general time, then where did the time used in the analysis come from? For, after all, in analysing simultaneous events, the aim is to demonstrate that time is not in general existence and the same everywhere; but, if so, where did the time used in the analysis come from? How was it created, generated, or invented as an artificial thing for cultural purposes?

Using time is using units of time; and on this planet the time units derived from the year are always the same. Time is always 'how much time'. It does not make sense to just mention time. In practice, it does not matter how the units of time are created or obtained. That is why in practice every time looks like general time permeating all the cosmos.[131] But now that we have learnt that there is no universal time, what matters is the philosophy (or metaphysics, if you like) of the creation of our time units. Further, are they created to apply to the entire universe, or, as Einstein said, every body has to have its own time, therefore our time is our own, and applicable only to this planet?

As Lorentz discovered, you can create your own local time, which is the genesis of the concept of space-time. Every time is like every other time, however it is created. All time can be interpreted as either cosmic or local time. Time is always the same. The most convincing evidence that time is not cosmic is the Lorentz local time idea. He called it local time, or t^1, not the same as ordinary time. He was surprised, even shocked, by his discovery and did not know what to call it; but he was

[131] Minkowski must have been familiar with this curious thing about time; his theory relies on it, namely, the second is the same whether time is general or local, dynamic or fixed.

certain in his own mind that it was not the same thing as ordinary time. This is important, because Einstein turned it on its head, and declared that all time is the same as any local time, or the same as the Lorentz local time; so he called it 'time, pure and simple'. In the history of the study of time, Einstein's observation is the greatest revolutionary thought about time. So Russell again got it absolutely right: the Einstein theory of space-time is the most important of all the ideas of Einstein. It means every time is somebody's local time. Our time is our local time for this earth.

Let it be understood that what we call 'earth time' has come about through brilliant mathematical works linked to ingenious suggestions and theories. Even then we still have zonal variations. The one crucial fact is this: the units of time, as divisions of the earth-year, are the same everywhere on this planet. The hours, seconds, minutes and so forth are the same in all zonal variations of earth time. One hour is 60 minutes everywhere on earth. Here we may note one of the commonest mistakes that cosmologists make about time in general relativity when they transfer earth-time's peculiar periodicities to other metrics. *Sixty minutes cannot be one hour everywhere in the universe*. It is so only on this planet because it is based on the earth-year. In every other metric one will have to discover similar repetitive cycles for suitable time units applicable only to that metric.

The important thing is knowing how our own time units are created; and we have traced them to the earth-year, as sub-divided with mathematics down to the seconds. Given the situation as Lorentz discovered, do we agree with Einstein that we create our own local time, as space-time, and therefore build up a consistently logical theory of time in harmony with all science, or continue to debate time as a mysterious thing that we cannot know how it came about and therefore imply that it is God-given? The latter alternative would be merely to justify believe in God. It is pointless, a complete waste of time. Religious people need no sophisticated theories to believe that there is God. And, frankly, I suspect the majority of mankind, including most scientists, especially the

mathematicians, feel more comfortable believing that time is providential than secular. Needless to say, they will not get my vote; but I know they will reply that, at 70, I am a grumpy old man well past my time anyway.

Our basic point-created time unit is the year, and it covers the whole planet. There is always time, because there is always growth and ageing, which are two of the natural events used to mark time for proper understanding (see Appendix I.) So, strictly speaking, the analysis of simultaneity belongs to the 'applications' of time, not how that time was created---in the case of Einstein the time was there already. However it was created, the time was there already; Einstein used it as it was for the analysis of simultaneity purposely to prove that time is not running all through the universe of which we draw or measure our own version, and therefore the same everywhere, and every place, in all circumstances and in all events: the total negation of the idea that a second is a second everywhere in the cosmos. This was part of the great man's exceptional brainwave theory of Frames. He used it to solve the problem of time dilation among others. The analysis of simultaneity helped to demonstrate it. I regard the issue of simultaneous events as one of the many *applications* of time after it is known or created as local time by the use of points in application to local space.[132]

Undoubtedly, if time is taken as 'given', so that we find it there in nature at birth and there as we die, without analysing its nature through mathematics, logic, or philosophy, then it is very mysterious, even scary, enough to make us seek sympathetic explanations from religion in the mistaken believe that there is God and He gives the religions all the answers to

[132] The Einstein action was a one-off act of genius. Such great men have the licence to do that. He should not be copied. The Order and Simultaneity of events are applications of time, and must never be used for the interpretations of time. Einstein, on the other hand, was right. As listed above, there were other insurmountable logical reasons for rejecting cosmic time.

life's mysteries.[133] But we should not seek to make time more mysterious than it really is with unanswerable questions about what it is and is not. For the real truth about time is that, apart from the secular philosophers and astute scientists, the rest of mankind is mystified by time; even the rational explanations must rely on such intricate mathematics and logical reasoning far beyond the reach of all but a few really intelligent scholars. Time, I must stress, is very easy to use but difficult to explain. Because it is easy to use and so vital to human action it requires deep thought to overcome the natural inclination to regard it as a 'Providential' bounty, but not many of us are blessed with the ability to philosophise.

(x) The ordinary concepts of before and after, past and present, seem to bother even the mathematicians and astronomers who help us to construct clocks. For it is the clock which is ticking units of time as we are born, and they go on ticking them as we die. Continuity of time derives from the succession of the units of time---again, the year is the notable example. Time is very mysterious because of the way it is interpreted by everybody. Of course, it mystifies everybody, including the present writer. The argument is that we can now find logical principles in its origins to attribute it to our local space. Here Einstein is indispensable. What we call time, he said, is our local time. Every body has to have its own local time because there is not one standard or universal time frame anywhere. Einstein inspired some of us to begin searching for the secular origins of our local time.

Knowing that cosmic time does not exist was a great liberating force, because until then time was so mysterious that it always left us thinking that there must be God. And so we learnt that time is produced, in Russell's remarkable phrase, as relation between points: "In the general theory of relativity, space-time appears in two ways: first, as providing a four-dimensional

[133] One is often reminded of the joke between a philosopher and a bishop. The bishop accused the philosopher of being like a blind man looking for a black cat in a dark room. "You will never find it", he says. And the philosopher replies, "True, but you would have found it."

order; secondly, as giving rise to the metrical concept of 'interval'. Both are relation between 'points', but both are treated mathematically as differential relations".[134] The Minkowski 'intervals', given philosophic interpretation, will serve as time 'in units'. But Russell pointed out that "…there is great difficulty in suggesting any non-technical meaning for interval; yet such a meaning ought to exist, if interval is as fundamental as it appears to be in the theory of relativity."[135] In another passage (in the same book, "Analysis of Matter" Ch XXXVIII), he wrote: "…the philosopher cannot but feel dissatisfaction with the apparent arbitrary assumption about interval…" This objection about lack of meaning is impossible to answer. The answer that will satisfy the logicians would also vitiate the suggestion that time is not independent of space, as mentioned above, because the units of the year that could provide that meaning are independent of the year, as the offspring thereof.

(xi) The union between the sense of duration and external cycles (which constitute time in my system) is worked out by relating the sense of duration that any physical intervals invoke to external cycles so as to give time-values to the intervals. Otherwise intervals of what? Of time, but how much time? Time is always 'how much time'. Thus it should be noted carefully to avoid misunderstanding that what I am saying is this: the physical intervals on paper do not constitute time, until they are linked to the sense of duration by some external mechanisms. The external mechanisms we use on this planet are the earth-year together with its mathematical sub-divisions down to the seconds. Otherwise the sense of duration will give a certain amount of time intervals---but of what

[134] Bertrand Russell, *The Analysis of Matter*, Ch. XXXVI. After careful consideration, I came to the conclusion that all time units are achieved or created as 'relation between points', simply because space-time is discrete, as the product of points applied to space should be.

[135] To overcome that arbitrary assumption, Einstein used the term "thinkable", which is worse than arbitrary assumption! The general effect is to reveal the logical defects in the Minkowski theory; and why some scientists claim that they cannot understand relativity without Minkowski is one of the mysteries of life as far as I am concerned.

value? *The minutes, hours and seconds that can be used to provide the value or values have got to be worked out first*. So far we have managed on this planet to work with the earth-year to our advantage. But the mere intervals are not time. One should say 'intervals of minutes, hours, or seconds'. That will make the intervals meaningful. *However, the hours, minutes and seconds have been established before hand*. Without them the intervals are valueless as time. Thus the Minkowski formula is not even logically valid.

The units of time obtained from the year with points (or mathematics) are thus 'products' of space and points. Therefore space on its own can never become time. The Minkowski 4-D geometry does not (and cannot in anyway) reflect physical reality as far as time is concerned, because time, as a product of space and points, will always be independent of space. Time is derived from space; we agree on that; but it is not the same thing as space. ***Another point is this: we can link duration to external cycles to obtain the time values; but there is absolutely no way we can link time (already in existence) to space to get the values to rescue the Minkowski intervals---that is clearly a contradiction in terms. How do we get the time; how does it pass by; and how does it continue so as to make time perpetually there? What we want to know is how we get the time values--- not to steal the time (already in existence) and then claim to link it to space, when the time is obtained from space in the first place as a product of space.*** In all nature nothing can be linked back to its parent into one entity, only as additional to it.

We cannot use such a false theory to alter physical reality to one of universal 4-D geometry. The best we can do is to say the Minkowski intervals could be given time-values through the earth-year and its sub-divisions; but then, after that, they become independent of space. So once we give the Minkowski intervals time values based on the repetitive earth-year, his 4-D formula is destroyed, as all time becomes 'relation between' the Meridian points, for instance, thus making time essentially discrete; discrete time can only be 'a product' of space using points; a product of space cannot be part of the same space

again---it will be independent of that space, or of any space. This is my entire argument, in essence, against the Minkowski theory; and the reader can see that it is logically sound.

This does not mean I have any desire to rescue the Minkowski proposal even as an act of Christian charity; to me he sounds religious, which is anathema of dreadful horror; but it is a recognition that no thinker's ideas can ever all be useless. Minkowski's imaginary time co-ordinates vitiate his scientific theory of time as space-time, again because they are imaginary. But we have got to acknowledge that he drew attention to the fact that intervals are obtained from space with points. If we reject his attempt to equate space to time in his ict equation, so that time is seen always as independent of space, as Einstein made it in special relativity, the intervals can be called time units to accord with the idea of sub-dividing duration with points, using external cycles—e.g. the years and its various sub-divisions taken together as 'time'.

The problem at present is the practice in cosmology where every space is space-time, and every time is also space-time, because space and time are supposed to have been unified by Minkowski with his ict equation----this cannot be retained because of his imaginary time co-ordinates. Again, as Eddington put it (time is the most difficult subject in the world, so the reader should grant me the indulgence of repeating certain notions at critical points in my arguments): "Such a mesh-system is of great utility and convenience in describing phenomena, and we shall continue to employ it; *but we must endeavour no to lose sight of its fictitious and arbitrary nature*." It can be used because deductions based on the imaginary quantities can be carried out consistently correctly---but the point is that it is not science, least of all, essential part of fundamental science, and our fundamental theory of physical reality.[136] So philosophers have a duty to

[136] If it were a theory in technology we couldn't use it---how could we use broken or dead electrical bulb, or how could a defective transformer give electricity? When Eddington says 'employ it', he confirms the judgement of Bertrand Russell, namely that space-time in the Minkowski sense, "…is a structure in which materials found in the world are compounded in such a

point out that using it amounts to a distortion of physical reality. The effect of this is clearly evident in the works of the interpreters of general relativity, where cosmologists are contradicting one another with strange ideas about time as space-time, a four-dimensional continuum. You cannot use imaginary quantities to create a new physical reality. It will not be true of the world; philosophers just have to point this out.

(xii) Let us examine Professor Eddington's judgement with regard to the Minkowski theory to the effect that, although fictitious (in plain language, it means it is 'untrue'), the arbitrary assumption at the heart of his formula can be used. Honestly, if a philosopher said this, scientists would claim that it confirmed nothing but his insanity, just because so many of them actually went mad. And Professor Sir Arthur Eddington was important; with regard to relativity he was extremely important not only in the number of books he wrote about it, but the fact that he was the expert sent out to Africa to observe the bending of light in a gravitational field to confirm Einstein's general theory of relativity. He was the professor who could not put name to the third professor said to be the third man to understand relativity---presumably besides himself and Einstein! He could not immediately think of anybody else; and this caused great amusement and sarcastic comments in the press at the time. He was wrong, of course. Russell, Whitehead, Weyl, Max Planck, Gödel, David Hilbert and many others understood it pretty well, though it was further claimed that not more than twelve professors understood it world-wide, and that, I think, may have been true until about 1920. Strangely, one must admit that Relativity is still not much understood, as one writer has

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manner as to be convenient for the mathematician". The problem is that mathematicians and cosmologists are propounding their suppositions based on this inaccurate Minkowski theory in which space and time are assumed to constitute one entity. What is going to happen to these theories based on Minkowski's fictitious formula? In precise terms, does the Minkowski space or Minkowski universe exist? If his theory is not true then the answer must be a resounding 'no'.

commented---see below. If we add the confusion or distortion brought in by the Minkowski formula, we can safely say relativity must be learnt all over again.

In another digression, therefore, I wish to say something to help those still struggling to understand Einstein. He was the most original, deep thinker of the universe that has ever lived. As such, of course, his ideas are broad, deep, complex and rather difficult. But there is a simple method for understanding his underlying ideas for the non-expert. After all we are never going to be able to write the necessary text books about his ideas; so I suggest that the novice should leave all the physics to physicists. When a doctor gives you medicine he will only tell you how to take it and what it is supposed to do for your health, or what it is meant to cure. It will be unwise for you to ask how the medicine was manufactured, or its chemical components. It is unwise because even if he tells you (which he certainly should not do), it will be difficult to understand. The same situation arises in respect to Einstein's ideas. The technical details should be left to the physicists. It is enough to know that it is true, tested and proved, and that its philosophical implications are so-and-so.

Next, he or she must concentrate on the logical basis of Einstein's ideas; these consists of what are supposed to be naturally in existence, or the natural conditions of the universe, not the mechanics to help us in the control of nature---which mechanics, as I have said, should be left to the physicists or specialists. We all need to learn the logical basis of his ideas, for they are what have come to him, specially, out of the billions of people in the world, so that without him the knowledge would have been probably lost to mankind.

They are, first, the notion that the universe is not one coherent body but consists of sectors, or fragments---sections, if you like. Each sector is different from the others because it obeys different natural laws. Do not try to learn what the natural laws are; they are rather intricate, the professional concern of the specialists, or physicists. Many readers are often troubled by these intricate mathematical aspects of Einstein's ideas, and

get lost as to why he is important. In fact, we do not know how he came by his logical ideas that seem to be cosmic in origin. To know the outline of these cosmic ideas, it is not necessary to go into technical details that, in the end, will enable the specialists to invent appropriate technologies to help man's struggle with nature. So the new student of relativity should leave them well alone.

The concept of the fragmentations of nature, each with its own peculiar natural laws, is known as the Einstein theory of frames, the basis of special relativity. And let me hurry to stress that it has been proved beyond any shadow of doubt. In fact, it was originally accepted because it came with solutions to existing problems, and insisted that to solve them we just have to accept the principles of special relativity he laid out.

The second aspect of his theory is that space is disturbed by the presence of mass, or of massive bodies. That the reason why we seem to be hanging in space and yet do not drop is that the curvature of space acts as a gravitational pull. Our earth is being pulled by the sun. The curvature of space is what we call inter-stellar gravity. It is not a force; therefore Newton was wrong on that point. This is known as Einstein's theory of general relativity. It has been proved; Professor Eddington was part of the team that performed the necessary experiments to confirm it.

Additionally, time came to excite the curiosity of Einstein; and when he turned his clearly incomparable sharp mind to the study of time, he found that time is dynamic and (therefore) limited to a frame, an inertial body, or one sector of the universe at a time.[137] There is therefore not one time covering the whole universe, for after all the universe is not one coherent 'whole' body. Time, he said, is basically local in nature, limited to your local inertial body. In fact, technically, time is limited to your locality, but that is too complex; we cannot go into that here. But if time is different in different places, so that there is no such thing as a universal now, and

[137] A time system that is dynamic cannot run through the cosmos; it must be different in different places.

one second 'here' is not the same thing as one second 'there', then, since time is so important in everything we do, we have to add time to the components of what we call physical reality. Space became the three natural dimensions in nature (width, length, and height), plus time as a distinct co-ordinate in its own right. To get to the roots of physical reality, therefore, you have got to add your peculiar time to the natural dimensions of reality, for the simple fact that your time will be different from other times elsewhere. This, of course, is the justification for the 3+1 formula in physical theory. It follows logically from the basic ideas of Einstein about the nature of the cosmos---he was strictly logical in his thoughts: if the universe is fragmented, then time will be different in different places; therefore, given the importance of time, this dynamic time must be added to phenomena as an additional (or a separate) co-ordinate in all theories concerning physical reality.

It was at this stage that Hermann Minkowski came in with his suggestion that, if we used the right mathematics, we will discover that time is already part of space naturally in 4-D geometry. This was an alluring proposal. Mathematicians and physicists fell in love with it immediately. The main reason is that Einstein made man (the observer) part of the observed since he has to add the time to the natural dimensions of reality. Thus, through the nature of time (in a world where there is no longer a universal time but only local time systems), the determination of what is physical reality partly depended on the whims of man.[138] To make physical reality completely objective, or scientific, without the intervention of man, Minkowski proposed some complex mathematics purporting to prove that, in actual fact, time is already part of space. Unfortunately for Hermann Minkowski and his admirers, at this particularly most productive intellectual period in human history, following the progress and optimism of the 19th century, some of the greatest logicians,

[138] It was not wrong because, after all, the determination of what is physical reality already depended on what the mind of man perceives, or can perceive.

mathematicians, and philosophers of genius were still with us (men like Whitehead, Dedekind, Gödel,[139] Weyl, Cantor, Frege, Hilbert, Russell); the cleverest of whom was Bertrand Russell, logician, mathematician, and philosopher of genius, as well as being a patient, clear and lucid kind of Nobel Prize writer. I just don't know how well to describe his genius to indicate that he was the greatest among a field of phenomenally clever people in physics, mathematics, logic and philosophy. It did not take them long to point out that the Minkowski theory rested on imaginary assumptions that were not part of physical reality, and therefore unacceptable. In other words, it was plainly false. Yet, to mathematicians, it made things rather easy for them in relativity. So up till now they are clinging to it, and will not so much as listen to any arguments against it. The result is, I conclude that technically relativity has been distorted. It seems we have not yet even begun to study the most important aspect of relativity, which is the nature and role of time in the determination of the nature of physical reality.

Part of the cause of the anomaly is that scientists are never considerate or charitable by making allowances for philosophers' (altogether) human mistakes. It is true, of course, that many of them wrote absolute trash, even

[139] Unfortunately, the Gödel formula known as 'the Gödel Universe' or 'Gödel Universes' is vitiated by the Minkowski theory upon which it is based. Every interpretation of relativity based on the Minkowski space is bound to be faulty because the Minkowski theory is arbitrary. It is from his objection to the Gödel formula that I came to realise that Stephen Hawking is a very good thinker. I love the logic of his thoughts. He could have achieved more without his crippling disability. The Gödel formula is rubbish, and to his credit, Hawking had the courage to say so plainly. What many scientists are hoping for is that time travel will be found to be real. In fact, it is not feasible simply because time as space-time is necessarily discrete. It does not run through the universe like some kind of a thread. So if one is going to refer to relativity then he must, on no account, consider time travel in any sense whatsoever. It is a religious idea based on the Minkowski imaginary time co-ordinates, and is complete and utter nonsense.

dangerous trash.[140] Bertrand Russell's *History of Western Philosophy* makes this clear. Even Aristotle was capable of such unforgivable crass bloomers especially in his Metaphysics and teleological arguments. Yet Aristotle must be given credit and excused his many mistakes, for after all he was only human; also he was a pioneer in an uncharted territory, and most of his other works were not only brilliant; they are still valid. For the discovery of syllogism and further application of logic to the external world, I put him on a par with Einstein in science alone. Yet scientists often condemn him as if he was an ordinary writer.

On the other hand, in the case of the Minkowski formula, which is adored by mathematicians and cosmologists, here is a theory of physical reality of the utmost importance---after the genius of Albert Einstein. It gives physical reality as 4-D geometry that is totally at odds with everyday impressions and perceptions of time in actual use. And some jokers even claim that the whole universe is subject to the 4-D geometry, and therefore call the Minkowski space "Minkowski Universe". In his defence, it is claimed that Minkowski used counterintuitive mathematics. In fact, his mathematical equations are straightforward once *i* is allowed. Deductions based on the *i* in the Minkowski theory are the kind of mathematics Russell described as tautological and trivial, 'as trivial as the statement that a four-footed animal is an animal'. The ict equation itself, the foundation of Minkowski's so-called complex mathematical edifice, is technically simple, and logically flawed, as he gets into hopeless difficulties over i and 'ct'. Yet the view of nature it is promoting is anything but counterintuitive. It is fundamental to the theory of relativity. On the other hand, we had the 3+1 continuum of physical

[140] "You see, the history of man is a queer thing. It's a history of a succession of attacks of intellectual madness, of all sorts of strange intellectual fashions. I don't need to give many examples of revolts against reason (such as Existentialism)…Russell saw these things in that light, and so do I…" Sir Karl Popper, in conversation with Strawson, Warnock, and Bryan Magee, in Modern British Philosophy, London, Secker & Warburg, 1971.

reality. Due to Minkowski we are told that it has been changed by imaginary quantities to one of four-dimensions; therefore space-time is not just time, 'pure and simple' as Einstein himself, the originator, called it. By Minkowski, space and time are said (merely said, not proved) to be inextricably unified into one phenomenon. Whatever happens to space also happens to time---they are said to be virtually one entity.

One of the many bizarre consequences of this theory is that when space curves, as in general relativity, time curls with it to no end. It is called 'the curvature of space-time', the basis of all physical reality in the universe. As a result, scientists seriously accept that time machines are possibly; in such cases one could meet his grand parents before they are (not were) born.[141] With clever computer simulations in impressive scientific tomes, we are told that all this has been proved, or that the computer shows that it is feasible.

So, naturally, the question arises: do we have to go on using the Minkowski theory with all these bizarre consequences? The claim is that without the Minkowski simplification of space-time as a four-dimensional continuum, relativity is almost impossible to understand.[142] Well, we know that mathematicians are the people making this claim; the answer to which is that if they cannot understand the Einstein theory of space-time, they should leave it in all humility to philosophers and logicians. Thanks to Bertrand Russell and his followers, philosophers are now far from ignorant of

[141] When Bertrand Russell, himself a mathematician of note, affirms in his *Mysticism and Logic* that because of relativity "the all-embracing time is a construction like the all-embracing space" (as quoted above) he means that man is involved in its construction. It is akin to the notion that the world of sense is also a construction, which is the most profound idea he and A.N. Whitehead promoted to account for our knowledge of the external world. But if time is a construction then one cannot see how a time machines could be possible. All such discussions are sheer irritating humbug, as irritating as religion itself, and those physicists promoting the myth should know better.

[142] This is plainly untrue. At best it merely provides simplifications; at worst, it leads to a distortion of relativity and the rational theories of physical reality it suggests, or implies.

counterintuitive mathematics. I conclude that the Minkowski theory of space-time as time is unacceptable because of his imaginary time co-ordinates. The fact is that this judgement is not original. Even Professor Eddington (Russell, Whitehead and others) have passed the same judgement; yet scientists who are determined to distort relativity have ignored them. Will they listen to a 70-year-old grumpy black man? I doubt it.

(xiii) Back now to the questions of past and present, when time is produced with points out of the fabric of space (any space), and therefore human in origin, and consists of individual units (or intervals) of time that have no connection with one another so that they pass through nature in succession, then there can be no past for that time; for time becomes one moment, one moment of time of whatever length; then the next and so forth, in succession for perpetual time; or one year then another, and so on. Time has no history; the tendency to regard recorded history as that of time marching on is wrong; events move on for they have antecedents and consequences; so what do have history are events; events have logical (that is, causative) antecedents and discernible consequences; the time is merely associated with them as they occur or are enacted through human action and natural events.

Let us be clear about this. If time was running through nature in a kind of a continuous thread of which we measure our own version in, say, the years and its sub-divisions, then it would have a history. It would have past and present and future: say, it is now here as a year; it was there before in a certain form; and will become so-and-so in the future. The notion of universal time persist partly because of Minkowski, and partly because scientists have the irritating habit of assuming, often only impliedly, that that is the true nature of time, and then try in vain to explain its past, present, and future, passage and continuity with complex mathematics, and get away with it for the simple reason that people are generally afraid of mathematics. When scholars of the stature of Russell and Whitehead told them they were wrong, these opinionated

scientists and mathematicians simply ignored such great thinkers and got away with it. Perhaps Bertrand Russell made a mistake. Perhaps he should have written a whole book to refute Minkowski as I am attempting to do, but a hundred years too late---a lot of damage has already been done to the theory of relativity.

Another reason is that mathematics is indispensable in the study of time, and mathematicians are incurable mystics. Yet, however repugnant it may seem, the practice is acceptable in science. The elusiveness of time makes it a perfect candidate for mathematical mysticism; Minkowski helped the process by conjuring time with his imaginary time co-ordinates; and just because it is the queen of the sciences, to contradict mathematicians is to risk such eternal damnation as to be a failure in life as a whole not only for a specific work. Into this intellectually murky field (but a fertile milieu for the triumph of mathematics), Hermann Minkowski dropped his, admittedly, alluring proposal for the mathematical interpretation of relativity, and the rest, as they say, is history. It is called arbitrary and yet the same scholars cling to it, and advise that it should be retained because there is nothing suitable with which to replace it; that it distorts philosophical ideas of physical reality is not taken into consideration.

(xiv) However, time alone is a scientific, philosophical, religious and practical matter of interest to every human being. The reason it is regarded as next only to life itself in importance is that everything we do is governed by the oppressive influence of time. People are attracted to ideas of time as a matter almost of life and death, partly because of myths and legends about life being the gift of time. People believe really seriously that they are given time to live. So a theory that shows the contrary is not only important but seems to be a life-enhancing potion, liberating the human psyche to get on with life without fear of time. Yet, rationally, time is merely a guide to life at best, not the life-giver as the religions want us to believe. In the circumstances, the Minkowski idea is godsend to the religious gurus. Due to his success and that of certain farcical books (and interested parties have ensured

the widest dissemination of something said to be counterintuitive even to philosophers and logicians), the popular idea is that time, as space-time, even after Einstein, has historically been moving on since Creation, or Evolution, starting from the so-called Time Zero. People think there is something called 'curved space-time' which introduces more mysteries of time and they add that it is scientific, coming from Einstein himself.

What is regarded as the past, present and future of time may be described as (i) Memory; (ii) Being, Existence or living in consciousness; and (iii), optimistic expectations based on the theory of probability---learned, inspired or innocent.

Memory is recollection of what may (or has) actually happened either in life, in dreams, in the mind's eye, imagination, hallucinations, or madness---the loss of rational control of our thoughts, either temporarily or permanently. Memory, as the capacity to repeat, is the mechanism upon which the sense of duration, as the internal sense of time, is based, and of which mechanical time is constructed.

The terms 'Existence' and 'Being' are inter-changeable, but they are not the same thing as time. The trouble for Minkowski was that he sought to equate them with imaginary quantities. And so he might; for it seems virtually impossible to equate them with real quantities in scientific thought.

Briefly, the future is always unknown; although we could guess, sometimes correctly, but never with any logical guarantees of success. It may be argued that we can see things passing by, and that it means the present can pass into the past. Or the motion may be going forward, meaning that things can pass into the future. It will take time to reach the thing going forward. So it is claimed that it has passed into the future of time. Yes, this is correct, but of no consequence. If you can see a car passing to go forward, good. If you cannot see it, why bother? It's gone, out of your immediate view; nothing to do with you. Logically the car has merely passed a point and that is its past. But we have to remember that events can have *antecedents and consequences*. If a car passes a point and goes

forward and you can observe it and whatever happens to it after that, all that will be consequences. The time when it passed the point is its antecedent. It is easy to get hopelessly confused about such matters but they are not really germane in the scientific study of time. They are mentioned mostly by those writers who claim that time is marching on, or that we still don't know how it began, continues, and passes by. I believe that events do march on and with their associated times of occurrence; but that time itself, being in discrete units, as space-time, cannot march on; it can only duplicate its units to make it seem continuous---the years for instance, always the best example.

Another consideration is using time, the application of time. Past, present and future events can be explained as the applications of time. These applications are often confusedly employed to explain the having of time, or the metaphysical nature of time in the human cortex; yet time and the applications of time are two different things. I have already mentioned the application of time in Einstein's analysis of simultaneity. In those days, time was supposed to be universal, permeating all the cosmos and the same everywhere. What Einstein wanted to prove was that time is different in different places and that no unit of time is the same throughout the cosmos. But he used clocks in his experiments. Einstein's use of the clocks was *application of time*. He used the prevailing time to show that *time on the whole* is different from what it was generally supposed to be. The reason there were no obvious conceptual confusion in the Einstein case was that, as mentioned before, he was assisted by three prominent factors about time recently discovered. To repeat them for the benefit of the reader, the first was the Lorentz local time concept, which Einstein regarded as essentially how all time (or any time) is obtained. I agree with Russell's interpretation that it means time is gained as relation between points, your own local points, as can be realised in experiment by moving from point to point in any space. With each move a certain amount of time is gone. But sentience is require, which at once means that man plays a vital role in the process of having time---of

converting duration to external time units. The years, for instance.

The second was the solution to the time dilation puzzle; and the third was the Einstein theory of frames, such that our time can only be our own local time, not applicable outside its own frame[143]----which was how Einstein solved the time dilation puzzle, and other problems in physics at the time. We can thus appreciate that the solution to the time dilation question agreed with the suggestion that time, all time, and any time, is one's local time. Professor Abraham Pais has suggested that the Einstein theory of frames is so important that teaching it to high school children would be beneficial. I agree with that suggestion; for I believe that the philosophical implications of the theory of frames are far greater than those of the curvature of space in general relativity, not least because it is directly relevant to us here on earth.

(xv) The reader may wish to know that I was persuaded to study time in depth chiefly because of the need to account for the passage and continuity of time, and found, to my surprise, that, lo and behold, there are no years in nature. There is always only one year. It is repeated to get more years even all the way to the millennia. In looking further, I realised that all the units of time are derived with mathematics form the earth-year; and they are all individual and separate; they also have to duplicate to pass by, second after second after second---similarly with the other units of time derived from the year or anywhere else. Time, any time, everywhere, will always be discrete because it can only be produced with points; and anything created with points must be discrete. With these realities in mind, I was permanently cured of all sense of mystery about time, and decided to treat it rationally like any other materially aspect of physical reality. Yet we all know

[143] If we have to use our own space (and peculiar cycles) for time, it is hard to see how that 'local time' can be applicable to other peculiar spaces and cycles. After all, one constant and unavoidable fact in the universe is that nothing stands still, and that changes are continuous and mostly invisible as the quantum theory demonstrates quite clearly. Even our own bodies are different one moment to another, and mostly irreversibly---e.g. ageing.

that the legends and myths of time persist, and will continue to persist.

Recently I heard a Television Journalist say a certain dead clock he was examining had been "overtaken by time itself."[144] This is typical of the general misunderstanding of the nature of time. It means time is one thing; the clock is another. What does a clock do? Measure time, of course; but that particular clock broke down so it had been overtaken by time which is marching on (time and tide, they say, wait for nobody). This, I think, is a very interesting point for close analysis. It is a safe bet that that Journalist wouldn't be able to define time, other than saying clocks measure time. In practical life, it looks very much as if time waits for nobody; but that is far from the logical nature of time.

A clock, any clock, merely repeats units of time it is programmed to replicate over and over again. The biggest clock is the earth-year. And it repeats itself. It does not move or march on. The year repeats itself; all other units of time are obtained from the year; and they also repeat themselves. Just look at the sub-units of the earth-year: we have seconds, minutes, hours, and so forth. They do not march on. They are repeated by the clocks to keep in tandem with the earth-year. It is not even correct to describe them as moving on to keep in touch with the moving earth. The moving earth has delimited specific units of its space round the sun to these sub-units of time derived from the year. The clocks repeat their allotted units, the same allotted units over and over again. We read meanings into the repetitions of time units; we give values to the units (as minutes or seconds, etc.) Otherwise the mechanical clock is senseless. To repeat one unit over and over is not to march. We leave the marching to the earth; and repeat its sub-units a certain number of times to coincide with one year, and start again. Even then, the earth's motion itself is not marching on. It is a repetitive cycle; going round and

[144] Clearly implied in this kind of statement is the idea that our time is our 'local time', and therefore different from natural time of (some) unknown provenance.

round again. The dead clock of the ignorant journalist mentioned above had simply stopped working, or broken down; it had not been overtaken by time itself. There is no time outside the clock; there is only myriad of objects living out their own life spans in a general flux of existence---and it is a mistake to take the being of things as time. Time requires points deliberately chosen to provide us with convenient units of time, or of duration.

(xvi) The best illustration of time I can think of is asking a school boy to go round the Cathedral in a city repeatedly, as already mentioned. You then count the cycles. So many cycles (including halves, and quarters), means the food you are cooking is done. Another number of the school boy's trips round the Cathedral, means it is time to go to bed, and so forth. In time, you can sub-divide his journey to get half ways, and quarter journeys, all the way to seconds and mechanise them in a clock, as we do with the earth-year. If he gets tired, and stops, there is no time. The basic clock such as the earth-year is the time. We have millions of clocks and watches; everybody seems to have one or access to some kind of a clock; so we are safe. But should all of them break down, or vanish, there will be no time on earth. The internal sense of time, as duration or the sense of things lingering in the mind, as part of the memory process, must be linked to some external repetitive cycles or there will be no time, since the mere mechanical time would have no sense of time to back it---a notable failure of the Minkowski system, as Russell has pointed out.

For yet another example, let us say you are coking food. You know it will take some time to cook and be ready to eat. But how do you know how long it will take? Thus you bring in our hypothetical school boy to go round the Cathedral a number of times. You count them to know how many rounds will elapse before your food is cooked. *That is the time needed to cook the food. It takes time to do anything*. The period the food requires is felt vaguely in your mind as 'a certain amount of time', or duration, or as 'during the cooking process'; that is the internal time-sense which we know as duration. You know it only as

the sense that some time will have to pass during the cooking process, when the food is cooked---that is a vague sense of duration, but you need that as your base in the mind to be able to count as to how many circles from the school boy are needed to cook another food.

Any clock which is out of service will merely fail to repeat its own programmed units of time; it will not be stationary to be overtaken by 'time marching on'. There is no other time; we have no other time but the earth-year, which is what we sub-divide down to the seconds; but the earth-year is not a journey through the cosmos, it is only a regular cycle; it does not move on beyond its cycle.

Like our hypothetical school boy, he does not do anything other than going round the Cathedral repeatedly. Since the earth moves in the same manner to give us our time units, it is wrong to suppose that time is marching on. The units replicate to make it seem as if time is marching on. Only events do so---with their associated times of occurrence, which mislead us into thinking that it is rather the time that is moving, or marching on.

The ages and centuries constitute the story of what is happening, the story of continuing events, that have antecedents and consequences, and they occur at certain times or dates. Unlike going round a Cathedral, the earth-year is very long so that we have had to sub-divide it down to the seconds---that is all the time there is in the world, i.e. by means of circular motions, not as a journey through the cosmos. Of course, it is true that the sun is moving us through the cosmos; but that is a separate issue not related to using the earth's orbits for time as a repetitive cycle.

(xvii) The capacity to repeat in the brain is all but chemically proved by now. At the very least, we are now certain that memory is the capacity to repeat a skill or an event, or an activity. You perceive or learn something and can repeat it. This implies a basic mechanism for retaining the thing to be repeated. That mechanism for the retention of sense impressions is part of the internal sense of time, because it is

part of the sense of things lingering, or enduring. It takes time to endure, so the mind (or brain) is familiar with time through the sense of duration. It is this sense that we extend outside by the use of cycles as years, or units of time, as illustrated with the school boy's cycles of the Cathedral.

The study of time using the earth-year as mere cycles should not be extended in cosmology as to where the sun is dragging the earth to. That is an entirely separate matter. The cycles are broken down to the units of time we obtain from the earth year with mathematics, or points, and additional features of the external world, such as the moon, the seasons, and day and night system. Similarly, the school boy's cycles can be broken down. But that is cited as a demonstration of how we use the earth for time only. In actual fact, we know that the units of time beginning with the second are all obtained from the year. They constitute specific section of the long orbit of the sun, and are therefore part of the space traversed by the earth round the sun in its regular journey that we call 'one year'.

(xviii) To the best of my knowledge, there are three main puzzles about time we all want the philosophers to explain for us, as they generate almost all the myths and legends about time.

The first is where time comes from, or how it is obtained and programmed into the clock. This puzzle is recent; it came from Einstein's adoption of the Lorentz local time concept as 'time, pure and simple'. The point has already been made that, prior to Einstein, nobody thought about time in the way we are now thinking about it.[145] Time was taken to be a mysterious natural phenomenon running all through the cosmos, and particularly feared because it made us age; it is there when we are born and there when we die; it has always been there. Time was eternal. And the religions made good use of this myth by

[145] Thus Bertrand Russell could ask his haunting question: if cosmic time is abandoned, then how do we get time to programme into the clock. Like all great philosophers his questions clarified the debate; and the effort to answer it has led to the rational or logical analysis of how we get time, or our time, to programme into the clock.

making it the gift of God, their own particular god, mind you. Hence we all assumed that time is 'given', and that it is the same everywhere; one second here is one second there and everywhere. Deceptively, that is the case on this planet; so the question was beyond argument: time is in general existence, permeating the universe and the same everywhere; we only need mathematics to draw our version in our own convenient units.

Needless to say, some restless souls, called philosophers or poets, never stopped debating the nature of time. It is safe to say everything we now know through Einstein may have passed through the minds of some defunct philosophers and balding bards, but the correct importance was not attached to them as they were out of context, or too far ahead of their time. Now we can see that those philosophers and poets who thought time did not exist came close to the truth; for until we learnt how to use external cycles (the years) to punctuate the being of things and our own lives as time units, there actually was no time at all, only bland existence, which must never be equated to time because time requires points; time is based on life, the existence or Being, not Existence or Being on time. It is rather seen now as counting external cycles to regulate life. Our hypothetical school boy goes round the Cathedral so many times as the duration of the night. After so many of his cycles you have to get out of bed, and so forth. That is time, but it punctuates life; the cycles we use for time give us shorter periods of our existence, or Being; it is therefore different from the Existence; and it is based on it not the other way round. The life is ongoing; the time cycles, or units, guide our activities: again, our little boy's cycles will enable you to know how many of his completed cycles means you have to go to the farm; how many cycles means you must return from the farm; how many means you have to go to work, and when to finish---time is a guide to human activities. These are precisely the things for which we use the earth-year and the time units derived from the year; how many seconds, how many minutes, hours, days, weeks, months, and years---as the repetition of cycles and the units derived from them.

Because the year is one unit of time, completely determinate, and does not continue in a linear fashion but has to end and be repeated over and over again, and since all other units of time are obtained from the sub-divisions of the year, the relativity notion of time appears to be pretty well irrefutable. Every 'body' in the universe has got to have (or create) its own time. As space-time, it relies on space; so every 'body's' time is created from its own space. I repeat the standard quote from Einstein and his major interpreters: "There are as many times as there are inertial frames. That is the gist of the June paper's kinematics sections."[146] Nobody seems to know how the inertial frames create or invent their time systems from their space. What we know is that it is a time system derived from the frames' own space, and therefore must have originated locally---this is where the original Lorentz term, 'local time', becomes instructive. It was, in fact, not a prognostic or prescriptive theory but a pragmatic one, because we have time; we had this time even before the theory was announced; thus it is pragmatic. We have to analyse time backwards to its origins, like the origin of the theory itself, to know how our time began. The origin of the theory was a quandary. Lorentz discovered that his time was running slower to outside observers, but to him it was normal.[147] He conjectured that his time was his own peculiar time, and the time of outside observers was their own unique time. So he called his time 'local time', and labelled it t^1 in mathematics.

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[146] I am surprised this is not recited by school children like the "Thirty days has November…" mantra about the months of the year known and recited by all school children. Professor Abraham Pais thinks it should be taught in schools, and he is right. It is not that difficult, and will help the understanding of the Einstein theory of relativity, which is feared at present as much as intricate mathematics. What Professor Pais is saying is that it is not intricate mathematics but rather a beautiful piece of literary work announcing a complex scientific theory and must be appreciated for its clarity of language by our literary experts and educationists as for its scientific genius by mathematicians and philosophers.

[147] This is the time dilation problem and it is discussed in a separate section below.

It was Einstein who conjectured further that perhaps all time is one's own 'local time', a theory later developed into the space-time concept. The philosophers set to work and soon realised that, with the Einstein and Lorentz theory in mind, when time is analysed logically, it would appear to be gained as 'relation between points'---points in your local space. Another idea that must be made well known and common to school children is the notion that space-time or local time is 'time, pure and simple'; in other words, all there is of time. Thus, our school boy's cycles used as time to guide activities is all the time you *can* have, even if you employ the most intricate mathematics. Part of my purpose in this book is to show how this simple idea of time, which is still valid, was distorted by Herman Minkowski with his 'fictitious' space-time of four-dimensional continuum, fictitious yet the same professors who called it so insisted that without it Einstein's theory of relativity cannot be understood by them, to which one may remark that they are not earning their keep if they cannot understand such a simple idea as Professor Pais thinks can be taught to school children.

Space-time is easy to mechanise into the clock; but then it will be because the explanation is inferred backwards from the clock to the point divisibility of space, the space traversed by the earth round the sun. So Einstein and Lorentz make us think about time's pragmatic origins; but Minkowski wants us to believe that it is conjured out of thin air with intricate mathematics. We all have to take exception to his interpretation of time, or of Einstein's idea of time.

(xix) The second puzzle we want to have explained to us in plain language is how time passes by; it is logically linked to the continuity of time or perpetual time, so that the topic is composite, known as 'passage and continuity'. *Of all the traditional legends of time, none goes deeper than the mystery of time's passage in consciousness*. You see, when Russell objects to the Minkowski theory because it does not give non-technical meaning of interval, he means to say it is all right to talk of time in the technical sense; yet here we are, processing it through our consciousness. How, for instance, does interval

passes through the consciousness in tandem with time 'passing by'? As relation between points, however, its passage can be easily explained. *For each time you move from a point to another point a certain amount of time is gone in the mind as in physical reality*. In the mind, it is duration; in physical reality, it is part, a piece, of the earth's orbit of the sun. Intervals, as I have charitably offered to Minkowski and his followers, like shorter periods of duration, can pass in a procession, provided it is understood that the intervals are produced as "the union between duration and the external cycles we use for time", not by imaginary quantities without psychological anchor (like the sense of duration, of things lingering) to link them to the external cycles we use for time.

The years increase in numbers to pass by and make time seem continuous. Perpetual time is simply a matter of counting the years as they occur in their individual units, and are repeated over and over again. Like our hypothetical school boy, if he stops going round the Cathedral he would not be able to give out the number of cycles for specific events; so the earth must no stop circling the sun, if it does, our time system will collapse.

The year remains our proper SI of time---see below. A useful analogy is this: suppose the earth is destroyed but one man was able miraculous to survive. Everything was gone; he had no clock with him; yet he desperately wanted to know the time. Wandering around on the lump of rock on which he was floating in space, he saw one old mechanical clock. It had stopped so he wound it up, and it began to tick the seconds away; but soon he realised that with the earth gone, there was no way of knowing how to set the clock to tell the time---whose time? What time? Which time? The time for the clock (all clocks on earth) is the time based on the earth's motions.[148] The units produced by the clock, any clock, is the

[148] The values given to the individual units have meanings only as related to the earth-year---this is what is lacking in the Minkowski intervals, as Russell has pointed out. It is a deficiency that renders the Minkowski formula completely unacceptable for being illogical, or not in tune with physical reality.

time; yet they are units we programme into the clock as the sub-units of the earth-year, as quantified time. Without the units, quantified time does not exist, only being does; but being is not time *per s*e because time requires points for the creation of the units to quantify the time, and that is provided by the 'Being'---this is the paradox I have found about time, which completely rules it out as anything but the creation of man. For without the units which are obtained from quantified time, time in the clock would not be feasible. In other words, as I have said over and over again, there can be no time.[149] Yet, with this paradox, it is easy to see how the process of inventing time began through the notion of local time: once time was seen as capable of being produced locally, it became the product of points because of the units---the year for example. We can thus infer how Einstein worked out his theory. You see, he cleverly called the Lorentz local time 'time, pure and simple', implying that all time is like that. The significance of this has been overlooked. For it automatically makes all time discrete---I cannot tell whether the essence of the earth-year played a role in his thoughts; but it must have influenced him somehow, because, in reality, there are no years. It is the one year we repeat again and again and again for all the centuries. From the seconds to the centuries, all time is replicated in units only.

This brings time down to earth from the cosmos, making it dependent on human mathematics for the quantification of the units. Therefore, if time can begin from anywhere (that Lorentz discovery was crucial), then it must be essentially discrete, because the only logical way for doing so---that is, for starting it from wherever you are--- is to use points, as the earth-year shows, i.e. being dependent on the Meridian point or line. That is the meaning of 'quantified time', which makes time necessarily discrete. Discrete time brings all the consequences listed in the Prologue above. So the problem of time---its passage, continuity and permanent nature---were

[149] That is the reason for assuming that any 'Beings' elsewhere in the cosmos would have had to create their times in exactly as we have done, i.e. by using external cycles to quantify time.

solved in a flash of Einstenian genius. My book is merely pointing out that the problem has been solved already but, because of the Minkowski distortion, it has not been noticed---so showing that the Minkowski theory is not true, as even Professor Eddington has averred, was germane to my argument. I hope the reader understands this.

(xx) In astronomy, we often hear of time going back, in phrases like 'far back in time'. This would seem to imply that there is a universal time stretching far back to the so-called Big Bang when existence is deemed to have began. No one can be certain that the Big Bang was the beginning of the universe. The universe is too mysterious. Perhaps the concept of 'layers of universes' more accurately reflects the nature of the cosmos. The Big Bang must have its own antecedents, for it surely originated from somewhere. Otherwise where did the materials the Big Bang distributed come from?

For our purpose, the concept of tracing time far back must be interpreted as tracing events far back, but you could associate some dates with those events. Otherwise, relativity time, limited as it is to frames, cannot be traced far back; for after all, as units of time, they are gone as soon as they are produced, which accounts for perpetual time: the year is gone on 31st December, and a new one begins instantaneously.

It takes knowledge of philosophy, logic and the theory of relativity, properly understood, to realise that time is absolutely secular. But mankind is basically religious. Because of the nature of life's tribulations and death, man is always either consciously or unconsciously seeking miraculous providential succour. As Carl Jung observed, man is always seeking a soul. He thought modern man had lost his ancient soul and is searching for a modern soul---so the African American musicians gave us 'Soul Music', and it seems to do the job quite well! It's all nonsense, of course. The idea that man has a soul, needs a soul, or is always looking for his lost soul, is manifestly untrue for the simple reason that no one can describe what the soul is like. What is probably true is that about Ninety-nine per cent of mankind do not possess the

mental equipment to live normal lives; yet once they are born, they all have the right to live their lives to the end. The real problem of every government about this matter has been misconceived. It is to reduce the number of people being born to suffer physical and mental agonies; for nothing is lost if people are not born; but everything is wrong when people are born to suffer in life.

The religions that prosper on the presumption that only God could have created time, and therefore man must worship, are the same organisations that promote large populations of mainly abject people willing to worship. One is at a loss to know what they get out of human misery, but they can't do so any more. We now know how we get our time, and also how any 'Beings' in the cosmos get their time---certainly it is complex, but purely secular.

Nevertheless, the philosophers have also failed us. Rationally, the philosophers and scientists ought to have known for centuries that time units such as the year come about through the use of points, for after all the year is repeated again and again, *add infinitum,* to get the centuries. And that is all there is of time; there is no other sense of time beyond that. Since the year is repeated that should have informed us that it is one unit, out of which all other units are obtained by the use of points or mathematics, and, therefore, is our proper SI of time.

Professor Whitehead used the phrase "a moment of time". He wanted it to be understood as "an instantaneous spread of the apparent world." This is in accord with what I have said about the earth-year. It is also just one moment (or unit) of time. It is a concept of time inspired by Einstein, because Professor Whitehead coined the phrase in his book on relativity. His notion of space-time, or local time, made time necessarily discrete, meaning that it can only consist of separate units, or moments, because it is produced with points out of the fabric of space.

I don't know where Einstein got his idea from, except to cite the Lorentz experiments. But it is noteworthy that the earth-year is precisely that kind of time---one moment, or unit,

however the length may be. We have, after all, to remember that our year might be just like one second in other parts of the universe; but to us it is so long that we have had to subdivide it down to the seconds.

Again, as mentioned in the Prologue, some very serious metaphysical consequence emerge from discrete time; and since our time is basically discrete, the Einstein idea is vindicated; Bertrand Russell was also right to define time as ‘relation between points’, for that is what the earth-year is; the passage of time can further be logically inferred on this notion of time; perpetual time no longer seems mysterious; and sentience is required to count the orbits of the sun as years; so time appears to have a human origins---bar the link with our natural sense of time in the mind as ‘duration’. This is the modern scientific view of time under relativity.

ELEVEN

Time dilation

I come now to the consideration of time dilation proper. It has been mentioned in every Chapter, but not properly cogently debated as yet. Time dilation was instrumental in the discovery of the special theory of relativity. Lorentz has admitted that he failed to discover special relativity because he did not take the problem of time dilation seriously. But, to me, time dilation is nothing but clock dilation; whatever it is, it results in (or seen to cause) the alteration of one clock's performance, and does not influence the whole of time, i.e. all other clocks, for instance.[150] The way in which our time is structured, only alterations in the motions of the earth can influence our time as expressed in the clock.

Briefly, as I have said before, Einstein had two major brainwaves, three if we add the light quanta hypothesis. He was, of course, incomparably great. Einstein's theory of special relativity is based on his unique brainwave that the universe is not one coherent body but consists of a multitude of fragments, each with its own natural laws, known as his theory of frames with which he solved the quandary of time dilation, as we shall learn from the mathematicians presently. The second was the brainwave regarding the cause of gravity, to the effect that gravity is not a force but is rather caused by the curvature of space due to the presence of mass.

[150] It is not entirely correct to assert that it causes "the alteration of one clock's performance". It most certainly could not do that; because to those carrying it there was no change in its performance. It only seemed slow to outsiders looking in from the outside.

Many of those writing about relativity have not really understood it. So many of their interpretations are simply false. A prime example is this question of time dilation as associated with certain events, local and cosmic. It simply is not true that, according to relativity, as one gets closer to the speed of light time will slow down to almost zero, so that you could travel round the universe and return many years younger---known as 'The Twin Paradox'.

Time dilation, known technically as 'the dilation of time as a measure of moving clocks'[151] was said to be very important; but is it still a quandary waiting to be explained? In answer to this question, I like to quote from Stephen Hawking's lavishly produced book, *The Universe in a Nutshell* mainly because he is a very popular and successful science writer. In the glossary of this book he defined time dilation as, "A feature of special relativity predicting that the flow of time will slow for an observer in motion, or in the presence of a strong gravitational field."[152] Did Einstein predict time dilation in his theory of relativity or rather resolved the problem that it was posing? Another question is this: do we really understand relativity---all of us? I have a theory why we do not really understand relativity and will presently spell it out.

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[151] In fact, it is a surprise to me that nobody noticed the logical anomaly in the technical name of the puzzle. But after Einstein, as always, we can now look back and realise that one clock cannot alter the whole of time. Whether you are sleeping, walking, running or even flying with your clock, its performance can in no way affect the essence of time. It can only affect its own performance; for a clock is not 'the time' in the metaphysical sense. Every clock is merely manufactured to reproduce time units deliberately programmed into it for reproduction for the purpose of helping you to keep in tandem with the cycles of the earth. Whether it does it accurately or not has absolutely no bearing on the essence of time as a whole. A clock can affect the essence of time only if it can influence the motions of the earth. For one thing, as Professor Eddington has confirmed above, there is no such thing as "the flow of time" under relativity; and he has even castigated those who believe there is.

[152] Stephen Hawking's, *The Universe in a Nutshell*, Bantam Press, London, 2001, page 208.

At first it was claimed that only three professors understood the theory; even then Eddington could not put name to the third professor, presumably in addition to himself and Einstein. But the theory is now more than a century old and several scientists have written about it in massive and lavish tomes. Nevertheless, let us study carefully what one honest writer was saying about our understanding of relativity just a few years ago, anyway before the theory was a century old, but not by many years, to be frank. In 1988 the question was posed as to whether we do really understand relativity, and further, whether at all it can ever be properly understood. I am afraid, I feel I have to quote a large chunk of one Editor's frank comments on the subject as this is of crucial importance: "The theory of relativity is eighty years old but we have not got used to it. In three-quarters of a century it has not succeeded in changing the habits of our thought. For a long time many persons regarded the theory as a philosopher's fairy-tale; others looked upon it as the sort of hopeless abstraction on which mathematicians spend their lives. Lately we have come to realize that the ideas involved in Einstein's work have consequences. This has increased our respect for the ideas without, however, helping us to understand them. To be sure, we no longer stare at relativity, in Luther's classic phrase, like cows in a front of a new gate, but this is more a sign of resignation than comprehension.

"The fact that the theory is still a stranger is not due to neglect. Many books about relativity have been written for ordinary readers. Leading scientists, among them the most gifted popularizers, have constructed ingenious analogies to make clear the physical and philosophical aspects of the theory. Einstein tried his hand at this kind of treatment. Eddington and Jeans wrote brilliantly on the subject, but were sometimes carried away by their own metaphors. *The ABC of relativity* by Bertrand Russell is a readable account; and I recommend highly two small, unpretentious volumes, now out of print and quite forgotten: *Relativity* by James Rice[153] and *The Idea of*

[153] Robert M. McBride Company, New York, no date was given.

Einstein's Theory by the noted Austrian physicist, J. H. Thirring.[154] Yet even the best of these expositions fails to satisfy the reader who is honest with himself that he has a firm grasp of the rudiments of relativity. The ideas and the paradoxes are carefully set forth; the paraphernalia of measuring rods, light signals and temperamental clocks are displayed; the effect is that of a conjurer's show. The tricks are made familiar to the onlooker, but he is not made familiar with them. He is entertained, perhaps impressed, but certainly not enlightened.

"Is one then to conclude that the theory is too hard for simple language? I think not. It is revolutionary, but no more so than the theories of Copernicus and Galileo. It is against common sense, but so at first were the ideas of vaccination and of men living upside down in the Antipodes.[155] The relativity primers have failed, I think, because of a dual misconception: the popularizer is convinced that he can make the subject plain without mathematics; and the reader is convinced that the subject can never be made plain with mathematics. They are both mistaken, but the reader at least has Einstein on his side. When his teacher of mathematics, Hermann Minkowski, built up the special theory of relativity into a system of 'world-geometry' Einstein remarked, 'Since the mathematicians have invaded the theory of relativity, I do not understand it myself any more'."[156] Given this fact, it is unfortunate that as clever as he was, Professor Eddington did not deem it necessary to mathematically debunk the Minkowski concept of 'world-geometry' and nip it in the bud, since it is plainly false, yet he merely labelled it fictitious and then went on to say that, despite its fictitious nature, mathematicians shall continue to employ it. This is not only a contradiction; the eminent Professor literally acquiesced in the virtual distortion of

[154] Robert M. McBride Company, New York, 1922.

[155] See J.E. Turner, "Relativity without Paradox", *The Monist*, January, 1930, for an interesting discussion of these points.

[156] "COMMENTARY ON THE THEORY OF RELATIVITY", an editorial comment from *The World of Mathematics*, Published by Tempus Books of Microsoft Press, 1988, Vol. Two, p.1083.

relativity, or even promoted it. I hope the present reader agrees with this judgement, for I am really surprised. Mathematically, all Professor Eddington had to do was point out that the square root of minus one cannot invoke time that was not universal, and so since Einstein had urged us to abandon the concept of universal time, the Minkowski formula was nil and void---and thereby earn the gratitude of Einstein who originally despised it. Instead, after his initial reservation, Einstein was prevailed upon by mathematicians to accept the Minkowski falsehood not only as true, but of great help to the clarification of relativity; all of which was untrue and probably dictated to him to append his name and authority to it. Thus Minkowski got out of jail to become the luckiest thinker in the history of science, just because mathematicians dislike the 3+1 formula, and rather prefer the false/arbitrary supposition in the Minkowski 4-D geometry.

Let me stress again that, because scientists use their earth-year mental periodicities of time, whether time is regarded as the same as space or not, the units of time will be the same for the scientists using them. Thus the Minkowski theory could not destroy relativity, that is the reason it was used in general relativity. What it destroyed is the underlying philosophy of time as a purely secular thing originating from here, our own inertial frame, and entirely human in origin.

I have my own pet theory why relativity is not generally understood. I think it is because every writer, however brilliant, approaches the theory's interpretation from the point of view of his or her own specialist field; no interpreter has been able to deal with all the philosophical and practical implications of relativity. I don't think even Einstein himself could have enlighten us. When you have a brainwave as startling as those of Einstein, you cannot yourself know all of its implications; some of these geniuses never even know any of the implications of their own discoveries. I have selected just four examples, ancient and modern: certainly Copernicus was one; Kepler was another. Luther did not mean to destroy the Catholic Church, yet his ideas did so damage it that, once

people realised that the authority of the Pope did not derive from God, it is a surprise the church is still functioning at all---surviving on the crest of human gullibility. Lastly, Max Planck was so shocked by the quantum that he did not understand or know what to do with it, even Einstein died still arguing that the Quantum theory must be wrong, yet it has given us Quantum Mechanics, and it works.

Above all, it may be sacrilege but I cannot accept that writers on relativity are completely conversant with all aspects of the theory. I will illustrate what I mean with consideration of time dilation. If time dilation, which seems to me to be the inspiration for special relativity, can be so misinterpreted, then other aspects of the theory can also be misunderstood. For one would have to be completely ignorant of the theory of frames to misunderstand time dilation and how Einstein resolved the quandary.

The whole of special relativity came to life because Lorentz found that moving clocks run slower; and he tried to explain it away by supposing that the phenomenon was a mere mathematical curiosity. So he thought it was not true time and called it an auxiliary time, or t^1, and said it may be called 'local time': the time you have created for your own parochial purposes, maybe as part of an experiment, but certainly not the true time of familiar acquaintance. *In fact, Lorentz had discovered the natural or metaphysical nature of time without knowing it: every time is somebody's 'local time'. Otherwise there is no time at all.* Here, I quote from the mathematicians themselves. My aim is to show how time dilation was a problem which Einstein resolved among many others then facing and crippling classical physics, not one that he predicted and which, therefore, by implication is supposed to be still a mystery; I regard that as the religious view of time dilation, for as science has advanced and prospered, after Darwin, time has become the last hiding place for God. Time Dilation was noticed in the pre-relativity world of 'General Time'; it was not predicted by Einstein---I have stated why it

was shocking to everybody in the Prologue, e.g. because time was supposed to be the same everywhere.

Anyway, here is the genesis of the Einstein theory of frames and how it resolved outstanding puzzles in physics to guarantee its acceptance as one of the original, truly great, theories in the history of the world, not just the history of physics. "Historically, the transformation formula [the Lorentz transformation equation was given, but the reader is spared complex mathematics, since it is not really necessary here] was first obtained by H.A. Lorentz, under the assumption of contraction of a rod in the direction of its movement in order to overcome the difficulties on the ether hypothesis, but his theoretical grounds were not satisfactory. On the other hand, Einstein started with the following two postulates: (i) **Special principle of relativity**: A physical law should be expressed in the same form in all **inertial systems** namely, in all coordinate systems that move relative to each other with uniform velocity. (ii) **Principle of invariance of the speed of light**: The speed of light in a vacuum is the same in all inertial systems and all directions, irrespective of the motion of the light source. From these assumptions Einstein derived [the transformation equation] as the transformation formula between inertial systems $\mathbf{x}$= (ct, x, y, z) and $\mathbf{x}^1$ = (ct^1, x^1, y^1, z^1) that move relative to each other with uniform velocity v along the common x-axis. *This was the first step in special relativity*, and along this line of thought, Einstein ***solved successfully*** [my emphasis] the problems of the Lorentz-Fitzgerald contraction, the dilation of time as a measure of moving clocks, the aberration of light, the Doppler effect, and Fresnel's dragging coefficient."[157]

If the reader was surprised that I described time dilation as nothing but clock dilation above, here is my justification. Right here, laid before our very eyes, and as a challenge to scientific mysticism about Time Dilation, is the technical

[157] From the "Encyclopaedic Dictionary of Mathematics", published by the Mathematical Society of Japan. ED. Kiyosi Ito. 2nd ed. Vol. II, MIT Press, Cambridge, Mass and London, England.

relativity inspired explanation, using the Einstein theory of frames via the two postulates, to solve "the dilation of time as a measure of moving clocks"; this actually means it is the dilation of clocks, not of time generally. Clocks (and time) outside the moving frame remain the same as they were before. Only the moving clock dilates but even then to no effect as it would be normal to those carrying it in the moving frame.

In any case, the puzzle was successfully solved by Einstein. It was not predicted by him so that it could be supposed that it is still outstanding. For, if it were still outstanding, it would constitute the greatest mystery in the study of time. But it is not so; to make it so from whatever motive from the pedestal of the scientific establishment is to distort relativity theory. No wonder even some scientists do not understand Einstein still. No wonder, also, that the religions have not missed time dilation's relevance to their dogmas in sermons.

I believe that Lorentz probably inspired Einstein to discover the two postulates and his concept of frames built upon them, i.e. the fragmentation of nature with each fragment having its own physical laws, and therefore time. Considerations of, and mysteries about, time are so nerve-racking for the human psyche that the problem of time dilation must be credited with helping Einstein to the discovery of the special theory of relativity. At least Lorentz thought so; he thought the failed to discover the theory because he did not take the problem serious. According the Abraham Pais, "He proposed to call t the general time and t^1 the local time. Although he did not say so explicitly, it is evident that to him there was, so to speak, only one true time t."[158]

Apparently Lorentz managed uniquely to get it right and wrong at the same time. But the issue was much more complex than he supposed. He was right because t^1 is different from the traditional time t with which he was accustomed. However it is so only in the way it is obtained; after that,

[158] Abraham Pais, Ibid, Ch. 6, 7 & 8

according to Einstein, it becomes 'time, pure and simple'. The greatest ideas are generally simple in origin; what makes them seem difficult is the process of accommodating them into the corpus of current or accepted knowledge. For since the current knowledge will be in use, the new ideas must be compatible with it, or show strongly why what is in use might be wrong---a very difficult intellectual task for any thinker. That was Einstein's achievement with his special theory of relativity; and even went on to do the same thing with the apparently rock-solid Newtonian theory of gravity.

Nobody should be surprised about the euphoria with which we greet his name. He showed that Lorentz was wrong as well as right, because, although he was right that t^1 is different, it is all there is of time, not just an auxiliary mathematical quantity. So he was wrong to consider it as a mere mathematical auxiliary.

As our own creation, it is, of course, our local time in two senses: it is locally created, as Lorentz imagined, for local purposes; and it is also the time of our 'local' inertial space, or our local frame, since time is derived from space---any space at all---with the application of points to space to create time intervals or time units, to satisfy the internal sense of duration that the external world is working in tandem with it for a unified sense of time or *of the duration of events, impressions, mental images, and so forth*. Most definitely, time is a union between the internal sense of time, felt as the sense of duration, of things enduring, and external cycles used to punctuate the sense of duration (so felt) into shorter and more manageable periods or units.

Under relativity time is limited to a frame. Frames are independent of one another. They originate from their own physical natures, and so do their different time systems,[159]

[159] This is what Lorentz thought, namely, that his aberrant time was originating from him locally. He was close, very close, to discovering Einstein's theory of frames and special relativity. Just that little touch of genius was missing but it made all the difference. It was not only that time is different in different places, but *why* it is so. To the master thinker it was

which, being based on points as applied to space, can only mean the time of a frame's space. Under the inertial frames notion, time becomes 'the time where you are', the time of your local frame. Thus the Lorentz local time concept came in handy. Einstein said five weeks after his recognition of this special relativity was completed.

Philosophically, local time or time for your locality (your time or your frame's time), must rely on points as applied to space; the reason why time can never be equated to space. It cannot be free of space either. This alone can be used to refute the Minkowski formula. Time relies on space; either as consisting of intervals or units (as I suppose) it can only be derived from space. *Space is one thing; the points constitute another separate class of entities, different from the space; and the resultant time is therefore a product of space and points*. This alone can be used to show that time is separate from space, and is not in anyway linked to space into one entity, such that all time is space-time, and all space is also automatically space-time; with little imagination this is then worked by mathematicians into bizarre theories of time, lumping it together with its applications, including the eternal mystery of time dilation, especially in general relativity.

Time dilation would be a matter of serious implications if time was something of a continuous tread running all through the cosmos and the same for everybody. It is not so; yet those who attach importance to time dilation behave as if they believe time is generally running through the cosmos and the same for everybody; therefore why it dilates under certain conditions seems a matter of cosmic importance to them. On the contrary, I think the real value of time dilation to Einstein was inspirational; it inspired him to discover his theory of frames. But the effect itself has no philosophical, least of all metaphysical, significance, since time does not run through the cosmos. However, it must be stressed that the ultimate

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simple; that, he said, was the very nature of all time, because cosmic time does not exist. So the Lorentz local time should be regarded as 'time, pure and simple'.

effect of the Minkowski formula is to make time universal again---*i.e. that it is in space as part of 4-D geometry*.

Let me conclude this section by saying I agree with the Russell definition of time as 'relation between points'; but if so, then time is space divided by points. To please the mathematicians we can use the notation $c^2 t^2 = s^2. p^2$. I have already explained that this means ct represent time, s is for space, and p is for points. Let us hear from the mathematicians that this is an improvement on the s=ct of the Minkowski formula in that the Minkowski theory relies on his ict equation, which has no logical validity; for time is not the same thing as space, nor is it linked to it into one entity, since time is obviously the product of points as applied to space, any space at all. It still means time is space-time, say, the time of your local space, for it can only be obtained when points are applied to space. And, oh, time dilation is a myth!

TWELVE

Was time invented by man?

(i) The time we know and use probably arose when we learnt to employ some repetitive cycles as the external mechanisms Eddington was referring to---the years, for instance (see below.) It is a technique that enables us to subject duration, sub-divide it, into shorter periods, as it goes on.[160] This is not difficult to understand. Let us suppose that there is an event. By the repetitive cycles that you have chosen you can count how many cycles elapse (have elapsed, or will elapse as a prediction based on historical knowledge), during the event. So, for example, if there is a long-lasting volcanic eruption, you can say it lasted so-and-so cycles----being years or other units of time derived from the earth-year, say seconds, hours or months.

Thus, as we have seen, properly speaking, the earth-year should be regarded as our SI of time. But the process has no end. From even the infinitesimal cesium units giving us the shortest periods of time at present, we could learn to sub-divide down to even shorter units of time. It all depends on the level where the units are too small to be detectable or sensible. But did man invent time? The true answer is no. We invented the technique for telling 'how much time'[161], so that all the

[160] It is most likely that man thought about time because of the day and night cycle, triggering the invention of a system to tell when to return from the farm before nightfall.

[161] This technique for telling how much time seems to be the beginning and end of time, because 'Existence' or 'Being' is all separate and individual, and one person's perspective cannot be used for universal or social time. Nothing runs all through nature to be used for time for all. Even the passage of existence is not adequate since all existence is not structured to

time we know is known in specific 'how-much-time' units only; this makes it look *deceptively* as if we invented the passage of time itself. It is important to bear this distinction in mind always. Real time, as the passage of existence in consciousness, is obviously natural, and most probably part of the mechanism of memory.[162] *What we invented is the act of teaching the mind to learn to use certain cycles as shorter units of the passage of existence to accord with duration in the mind*.

Or let us say, you remember some event or events and want to know how long they lasted; with historical knowledge you can even predict how long some events will last. Thus at sunrise you instinctively know that it will set. How long it will last before setting is provided by some of the units of time derived from the earth-year with mathematics---that, certainly, is a human invention, but it happens to be all that usable time consists of, outside the tortuous imaginations of philosophers and mathematicians.

(ii) However, the concept of 4-D geometry implies that time is present in all space in the universe without human intervention. Intrinsically, this makes all arguments about the origin of time superfluous, for which reason scientists have invented 'Time Zero' to make time 'seem' to be coming to us from the Big Bang. I hope the reader gets the impression that something is being concealed. To hide the inability to define time properly, Time Zero was invented, as it were, to cement the Minkowski formula for 4-D geometry. But the problem is still there; the need to define time logically cannot be brushed aside.

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pass in tandem as one form of motion to be usable for time for all and sundry.

[162] We have to accept that the most logical definition of time is that it is the passage of existence in consciousness; but with the proviso that it is time individually experienced and therefore private or subjective. Time for the planet covering all of us, is obviously time in the clock. This was invented by man using his mathematics in association with several features of the planet---e.g. day and night.

The bone of contention is this: to mathematicians, cosmologists, astronomers and theoretical physicists dealing with the ultimate of physical reality the Minkowski ict equation makes all space synonymous with time---that time and space are unified into one entity as 'space-time', leading to a 4-Dimensional metric (or geometry) all over and everywhere. If true, then the whole of space in the universe is 4-D geometry; and true to form, scientists refer to the Minkowski theory as "The Minkowski Universe".

As against this, I argue with support from Professor Eddington, Russell and Whitehead, that this theory of ultimate physical reality is logically wrong. My point of view is that the term 'space-time' is unavoidable, because of Einstein, as another name for the Lorentz local time concept, but it means merely that all time is derived from space with points or mathematics, as Einstein made time in special relativity.

In the absence of a universal time, the question as to where our time comes from to be in the mind was not discussed by Minkowski. I regard that as a deficiency of his system, for a start. On the contrary, I recognise that time is always in the mind as duration, the sense of things enduring, and therefore it is most definitely part of the mechanism for memory, recalling that Professor Ritchie Russell defined memory as 'The Capacity to repeat'---but we cannot go into that here because it will be a digression too far. I concede, however, that for one hundred years scientists have relied on (actually used) the Minkowski theory in all their suppositions; what this involves is that all space is called 'space-time, and time is also 'space-time'. The reason why it works (or seems to work), is that earth time and its periodicities are carried by researchers in the mind, and used as if time is present in every space. *If we could use robots the situation would be different, as they would not have minds filled with earth time's periodicities that they could then ascribe to any space in the manner cosmologists are doing at present.*. Professor Sir Arthur Eddington was partly responsible for saying that, although 'fictitious and arbitrary', the Minkowski formula shall be employed.

Minkowski failed to show that *time is a union instead* of the sense of duration and what Professor Eddington referred to as 'external mechanisms'. To me the external mechanisms are the regular cycles we use to mark time---in years, sub-divided down to the seconds. The logical basis of the Minkowski theory is his ict equation. Yet that equation also relied on imaginary time co-ordinates; as such I argue that it is logically invalid. I have no quarrel with the ds^2 formula, so long as the space it denotes is not taken to be the Minkowski space where time and space *are assumed* to constitute one entity in a 4-Dimensional geometry.

For me, the world of physical reality remains as Einstein left it, namely the 3+1 continuum in which cosmic time is abolished, and local time which replaced it is absolutely independent of space. Since time was made independent of space in special relativity, it must be so in all inertial frames.

(iii) And so we arrive at the question as to whether the arrow of time exists, or is really relevant to a time system that is basically discrete, passing by the duplication of its individual units? For centuries we have been told that the arrow of time is what moves time on and on, the vehicle of time, time's universal transport system without any visible mode of transport. Yet if the all-embracing time does not exist, as Bertrand Russell avers in his customary intelligent manner, then how can there naturally exist an all-embracing arrow of time moving "all time" on and on as an all embracing, universal transport system? In actual fact, wherever you may be, your time in your clock must be programmed to be passing in units---say, hours, minutes, seconds, and so forth---since there is no such thing as an all-embracing arrow of time to move it on. The notion that time passes silently by means of a mythical or an invisible arrow is not tenable under the concept of quantified time, as explained in Appendix I below—i.e. the only usable time is quantified time.

In my opinion, the arrow of time idea is no longer worthy of serious intellectual discourse. Normally I do not want to mention it at all. If it is meant to account for the passage and

continuity of time, I have already given what I consider to be the most credible logical explanation, in so far as time is space-time created with points and therefore naturally discrete.[163] Time's arrow for everybody's time is the succession of everybody's time in individual units, the succession being "the act of passing-by" without any need for a mythical arrow, the best example of which, again, is the passing years. *The years require no arrows to move them on and on, simply because there are no years only one year is replicated incessantly to move on*.

Let me stress again that there is always only one year. Similarly all the other units of time derived from the year are individual---there is always only one second, repeated to be seconds, and so forth. Furthermore, the year ends abruptly at the end of the earth's orbit of the sun. To get another year (that is, for time to move on as if by some arrows), we simply repeat the journey round the sun.

From this point of view, the arrow of time notion is a joke. However, it seems many philosophers and scientists have chosen to ignore this, and have thus jumped to the conclusion that there are several arrows of time. This was the thesis of a recent book on the subject.[164] Some of the contributors of this anthology identified seven arrows of time. Yet if we are to have multiple arrows of time, the logical process will end in infinite number of arrows, because every one can have his own time, in accordance with the theory of relativity.

[163] The arrow of time is supposed to move time or transport it through nature. But it is obvious that discrete time cannot be transported in a train; though it can replicate; its separate units can multiply to form a procession, which in psychology means "time going".

[164] See *Time's Arrows Today: Recent physical and philosophical Work on the Direction of Time*. Cambridge, 1995. Ed. Professor Steven F. Savitt.

THIRTEEN

Why the year is our proper SI of time

This has been mentioned before, but only briefly. The notion of time as a union between the sense of duration as the seat of time in the mind and external features of the world is secular, owing nothing to any religion.[165] It implies that time does not exist until somebody uses external cycles to create units of time, in accordance with his sense of duration. That somebody may be you or your ancestor, as it appears that the sense of duration is part of the general functions of the mind.

In other words, there is a human aspect of time. The duration may be part of the mechanism of memory (i.e. retaining things in the mind as enduring and counting external cycles as the units of the period of that 'duration'.) This secular time is strictly discrete. Conversely, the notion of time as a general phenomenon permeating the entire universe may be called the religious view of time; its central thesis is that time is the same everywhere, so that a second is a universal unit of time throughout the universe; and, secondly, that it is eternal and began with creation, or the Big Bang, before which there was only "Zero Time".[166]

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[165] The logical case against all the religions is that they were invented by human beings. The founders claim that God spoke to them in revelations; but then they would say that, wouldn't they? In America they joke about it. Some scoundrels in America exporting their religions to Africa confess that religion is the quickest way to make your first million.

[166] Of late astronomers appear to have seen the light and are thus putting it about that the Big Bang brought only this universe into existence, and that there are other universes. So it is only this 'young' or 'new' universe that is about 13 billion years only. Still some stars within this young universe are millions of light years away.

Unfortunately, using the year as the SI means our time begins with the year, the mere physical orbit of the sun, and ends with the year, simply because we have to repeat the journey round the sun to get another year, or continuous time. Since the year is the product of points (via the Meridian), the discrete nature of its time is guaranteed to justify the implications mentioned in the Prologue.

This secular time is probably repugnant to some thinkers, including mathematicians, most of whom are incurable mystics in keeping with the ancient Pythagorean practice. The Minkowski distortion of Einstein's theory of space-time, I think, belongs to the attempt to outwit Einstein and restore the mystique of universal time---one that is invoked by mathematical symbols representing nothingness on the concealed assumption that time is eternal. With this background, let us now consider why (or if) the earth-year should be our SI of time.

The year is the basic unit of time out of which all other units of time are extracted with mathematics in association with 'additional' physical features of the world---like the daily, weekly and monthly cycles. By contrast, the second is one of the sub-units of time derived from the earth-year and add up ultimately to one year. Nothing goes beyond the year and its subdivisions as time. To continue counting time, we simply repeat the year. It is important to bear this in mind always in the study of time: the year is the beginning and end of earth time. It is also what we multiply to get our longevity; even the arrow of time translates into a succession (or a number) of years. People do not speak of time in this restricted sense; usually they include the internal time sense and the passage of existence in consciousness, all together, in confusing statements about time. These people will no doubt raise a howl of protests for defining time as limited to the earth-year. On the other hand, we are here trying to establish the logical credentials of time in the clock; and for time in the clock the above definition seems correct.

Now, the fact that the year is a human creation, just a technique, that can be replaced with other repetitive cycles (or regular motions) is easily illustrated by using the hand to describe cycles in the air, calling each cycle what you will, say, a month, a week, or a year, and so forth. There are two insurmountable problems, though. First, your hand will develop repetitive strain injury. RSI will ensure that you could not circle your hand for long, and certainly not forever. Secondly, the years will increase in numbers because your little hand's circles are short. Whatever you choose to call your hand-cycles as your (or the) ultimate unit of time described by the hand, will vastly increase in numbers, as your hand-cycles are shorter in comparison with the earth-year cycle. They will be so many that a lifetime will run into millions of years. But no matter. In actual fact, it will be just a question of numbers to tease mathematicians and accountants.

In every case, it is just a matter of deciding 'how long' is something lasting or has lasted by counting a number of shorter cycles of 'living', or of life, the same on-going long life not yet ended. It is just like a long journey with 'stops' (junctions or rest stops, if you like) on the way before the end. These cycles must be related to something's endurance; that is the reason time *is seen as* based on the sense of duration in the mind as the sense of things 'lingering', or stored, as part of memory; and it is the union of duration and these external cycles we mechanise in the clock as 'time' for general use.

Our ultimate time unit for deciding 'how long is anything' is the earth-year. Yet, at present, that is not our SI of time. Rather the second is our SI of time. It is odd because the second is not the end or the primary unit of time, but rather is derived from the year, and can be sub-divided down more than a million times. This SI concept is based on the "Système International d'Unîtes", which, in turn, is derived from what mathematicians call m.k.s---metre, kilogram and second. Of course, later on Govanni Giorgi (1871-1950) added 'A' to m.k.s. to give us the standard MKSA, or the *Giorgi system*.

I may be prejudiced (indeed, I think I am hopelessly prejudiced in favour of science, and implacably opposed to every religion and acts of worship by human beings anywhere); but I have to confess that I can see no logically compelling reason for choosing the second as the earth's standard unit of time---which is what it really is.

The philosophy behind the second as SI is shallow. I suspect it came out of the fear of the philosophy *behind* discrete secular time with the idea that there is no such thing as a *universal now* where time units have no universal validity or application; as opposed to *general* providential time, where the difference is that there is such a thing as a *universal now*, and therefore time units have universal validity and application, so that the second is the same everywhere throughout the universe. On the other hand, it may be due to the sheer force of tradition. But I know mathematicians argue that it gives a more rounded (manageable) figures to equal the periodic pulses of the caesium atom. And following the mathematicians all scientists stress this last point, namely, that the second is "equal to the duration[167] of 9192631770 periods of the radiation corresponding to the transition between the two byperfine levels of the ground state of the caesium—133 atom".[168] It all amounts to saying that the second was chosen for convenience.

The point, however, is that the second is neither the primary or ultimate unit of time since it can be sub-divided down to millions of sub-units. Secondly, we derive it from the earth-year which is the basic unit of our time. Thirdly, it can only add up ultimately to the year----and start again. All time begins with the year and ends with it. Logically, that should be the Standard unit of time. But it would seem that the philosophy behind regarding the earth-year as our SI of time is not one that the mathematicians, who are always, I repeat, incurable mystics, can live with; the same reason for accepting

[167] Note that duration is mentioned here too as having a crucial, indeed, essential role in the having of time.
[168] Since this is the standard definition there is no need to cite sources.

the Minkowski theory of conjuring time out of the thin air with the square root of minus one, because the local time idea is completely secular.

FOURTEEN

Summary and conclusion

The problem of time is partly religious, partly philosophical and mostly scientific as we need mathematics otherwise we could not have time in units. There is only one year. We use mathematics to establish that since we need points to create the year out of our orbits of the sun. Successive orbits of the sun are counted as 'years'. But somebody must be there to count the orbits as years or there will be no years. That is part of the science of time.

First, the religious aspect. This needs not detain us long. In fact, religious leaders merely arrogate the right to pronounce on the nature of time through the appeal of tradition, because in the dark old days every 'thing' was attributed to Creation out of ignorance. To my mind, that is the sum of the knowledge of time religious thinkers have contributed to mankind. Creation covers everything. Time was created by God. It permeates the entire universe and the same everywhere and to everybody. The units of time, such as the year, are universally applicable, and so forth. According to Archbishop James Ussher, the Creation itself occurred at 9 am on 26th October 4004BC! The centuries preceding that are not accounted for. The date for the end of the world was also given, but it has been changed several times; and since no theory accounted for the future, it was inevitable that the date of destruction would be revised, until we repent.

The philosophy of time owes more to the imagination of poets than philosophers. But occasionally we get quite serious thinkers applying their acute minds to the study of time. Plato, Aristotle, Hegel, St Augustine, Henry Bergson, Kant and Spinoza may be considered the serious philosophers who

discussed time somehow rationally, or logically, in their own fashion, I should add. Gottfried Wilhelm Leibniz (1646-1716) was an exceptional thinker. He found that time is succession (*Philosophical Papers and Letters*). It sounded strange; but in our post-relativity world, we have realised that time is discrete, with one unit of time following another, the years, for example, always the best example. But long before that the year was repeating itself to continue---that was a succession of time in units, namely, in years---except that thinkers failed to think in such terms, until Leibniz made his perceptive comments about time being 'a succession'---in post-relativity science, 'a succession of time units'. Aristotle also deliberated on time, but he was always a problem. Perhaps the greatest philosopher of all time (for discovering syllogism), and the greatest scientist bar Einstein (for applying logic to nature. Subjects like Biology, Physiology, Psychology and Geology came down to us through his genius. Yet he was capable of such bloomers at times that you cannot help but laugh---that is, with our present knowledge, of course. In his day he was as supreme as Einstein, and deservedly so.) The best that can be credited to the philosophers is that some of them discuss the whole of time: its very essence, origins and probable end---this last being something coming from the influence of religion; also its scientific nature, and even its large corpus of mysteries and vagaries; most of which, again, owe their existence to the religions and human gullibility. Everybody and every thing have been influenced by the religions, mostly adversely.

As hinted above, the scientific aspects are the most interesting. We need mathematics to have time in units, for time is known, and used, only in units. All units of time on earth are derived from the earth-year with points, or mathematics. But pure mathematicians like to dream and call it reality: "The pure mathematician deals with ideal quantities defined as having the properties which he deliberately assigns to them. But in an experimental science we have to discover properties not to

assign them."[169] By their suppositions time has come to be equated with being. Yet being is not time *per se*, because time requires points----somebody must be there to set the points and count the orbits of the sun as years.[170] If we do not call the orbits as years, there will be no years, only blank existence, known as "Process and Reality", thanks to Professor Whitehead.[171] Through the 'process' we get 'our' reality, or reality according to our senses. In the absence of that there is only bland existence. Man gives meaning to the outside world according to how he processes phenomena through his mind. It is a mistake to regard the *being* (existence) of the sun and of the earth as the causes of orbits and the years, and therefore *being is* time. Space, too, is not time; time is derived from it; the space is *used* for time, just as roads are used for transport.

The religions claim that time is eternal and that it gives the life itself, so that a life is given how much time to live. We now know that this is not the case. In fact, the time is wrought from the 'Being'. Man counts the orbits of the sun for his own purposes as time, a means of establishing shorter units of existence, either as it goes on, or to apply to past events. The orbits are used for time as a means of breaking life into shorter periods of existence---again, the whole of one's life is duration. The years punctuate that life thus sub-dividing it into shorter periods of duration, say, how many times a boy ran round the Cathedral during the existence of that life, so as to be able to tell 'how long' a person lived, or lives. The time tells how long (or how old) is the existence still going on---how many cycles have passed since it began. The existence itself cannot tell how long it has been there; that is one reason why 'Being' *per se* is not time. Without time in units there is no way of knowing that. Also, without our hypothetical school boy running round the Cathedral and calling each run a

[169] Sir Arthur Eddington, *Mathematical Theory of Relativity*, Cambridge, 1930----from the Introduction.
[170] These include the cesium units since they always have to be related to the second to make any sense.
[171] See *Process & Reality: An Essay in Cosmology*, by Professor A. N. Whitehead, Cambridge, 1929.

specific name (or a unit of time), you cannot tell how many 'years' a life will last.

The study of time is the most difficult thing in the world; and it is safe to say without Einstein, and perhaps Anton Lorentz as well, we would still be regarding it as the gift of God. In fact, it is the gift of the mythical boy who could magically run round the Cathedral perpetually, thus giving us 'perpetual time' of the religions. No one is claiming that the religions did not have a point; we know many of their leaders were deep thinkers; the claim is that their point was not as mysterious as they thought, and that we can have a rational explanation of time without invoking the power of any mythical God they can dream up.

To recap, science has taken over the explanation for time with its compulsive mathematical rationality, so that we are obliged to think of time solely in terms of science. However, it must be admitted that (probably) everybody in science believes that there is an independent entity called 'time' everywhere in the universe, and that the concept of 'local time' merely illustrates how we draw our own time for use 'locally' from the quintessential time in nature, that is why they are talking of Time Zero as the period from which time began. This is a painful irony that must delight the religious fanatics. For, on this interpretation of time, the Minkowski formula of space-time makes sense---it means time is present in all space; we just have to invoke it with imaginary time co-ordinates known in mathematics as the square root of minus one, or i. Thus Minkowski was not required to show where his time is coming from. You just invoke it with the appropriate mathematical symbols, because it is present in all space. And scientists are happy with that!

Yet the analysis of time under relativity shows it to be a dynamic concept we apply to nature wherever we may be. Being dynamic means it is changeable under different conditions. That, precisely, is what Einstein established with his analysis of Order and Simultaneity. This led the philosopher Bertrand Russell to conclude that "There is no

longer a universal time", in one part of his book, ABC of Relativity. In another part he asked, since there is no longer a universal time, what is measured by the clock? The result is that (far from such a fundamental question being ignored) everybody has silently concluded that there is time, some kind of time deriving from natural sources. They then assume that local time means we measure our time 'locally'. So we have to refer back to the fact that time is dynamic; if it is dynamic then it changes at different points, or under different conditions---and therefore at every point of the change, it has to be *re-created, re-invented, reset, or simply different.*[172] Therefore there is no cosmic time of which we draw our own version as our 'local time'. And that being so, how did our time begin?

These are the sort of questions we must ask when we are considering the Minkowski formula, because that formula relies on the fact of time being in existence somehow, and of which we measure our own as our local time. Thus Minkowski is faulted on two basic grounds: one, his ict equation cannot link space to time because it relies on imaginary time co-ordinates. It may be all right in mathematics to use imaginary quantities or numbers, but in deciding what time is metaphysically, we cannot do that, otherwise we could have as many imaginary times as there are people in the world. Secondly, and as a result from the first point, he cannot show where the time which he is purporting to link to space, is coming from. Furthermore, by failing to take account of duration as the sense of time in the mind, Russell has pointed out that his intervals, which are supposed to represent time, are bereft of sense or meaning. In his own words, "…there is great difficulty in suggesting any non-technical meaning for interval…" ---*The Analysis of Matter*, Op. Cit, p.397.

[172] Bertrand Russell put it best: from the sun's point of view the tram never repeats a former journey, because each journey's time co-ordinate would be different. Before Einstein's theory of relativity, this was not known to be relevant in physical theory; but we now understand that time is a distinct co-ordinate among the components that determine the nature of physical reality.

It is often the case that the purpose of a theory determines its fate. Psychoanalysis is obviously flawed, yet we honour Freud for his noble efforts. Herman Minkowski had no such noble intentions. His main purpose was to show that the Einstein 3+1 formula is unnecessary because time *is always* inherent in space to be invoked with the appropriate mathematics. But I have already noted that if time and space *are* naturally linked we could never have had time on its own as it is in special relativity. Secondly, Minkowski had to rely on imaginary time co-ordinates in his so-called counterintuitive mathematics for his theory. Yet there is no such thing as 'imaginary time', to be invoked with *i*. On the other hand, we want to define time logically and show how it passes and seem perpetually continuous; and I humbly submit that for that purpose the 3+1 formula is adequate. I have to add, additionally, that Einstein never saw the need to go back and reformulate special relativity to include time as inherently part of space. He did include it in general relativity; but there again I think he was coerced; and I suspect it was a mistake because the role of time as identical with space is adversely affecting the debate about general relativity.

EPILOGUE

Finally, I give the honour of the last word to Professor Sir Arthur Eddington who was intellectually almost on a par with Russell. I was delighted to find him saying almost the same thing as I have said about duration (as time in the mind) and external time, except that I think we link the two for time in the clock so that time *is,* and will *alway*s be, independent of space. But he noted, "The rough measures of duration made by the internal time-sense are of little use for scientific purposes, and physics is accustomed to base time-reckoning on more precise external mechanisms."[173] ("Mathematical Theory of Relativity", Ch. 1.8.) These external mechanisms make sense because the mind knows duration from the sense of things enduring. Also, the mind is familiar with the use of points because duration requires points. Note that the internal time-sense Professor Eddington is referring to is not the same thing as the so-called internal clock of the mind. The internal clock refers to the mimicking of time by the brain through past experience and expectations.

[173] This has already been mentioned above, but the reader should pardon the repetition and additional comments as it is so terribly, terribly important. It shows the origin of time in the human cortex and how it is converted into the clock for general use. It should always be remembered that time has two aspects: the internal sense of time as the sense of duration, and how it is linked to external cycles as illustrated with our hypothetical school boy going round a Cathedral and counting the cycles as the rates of time. We do the same with the earth cycles but in a more intricate manner to get the sub-divisions all the way to the seconds as sub-units of time to the year.

The essential difference between Einstein and the rest of us is that he knew more of the laws of nature. Planck's Constant was extend to all matter by Einstein; and the Lorentz local time became 'time', pure and simple, in the hands of Einstein. Thus, in the end, the best logical definition of time seems to be this: "externally time is space divided by points in units as determined by duration in the mind".[174] The mathematical notation may be written as $c^2\ t^2 = s^2.\ p^2$, where t represents time, s is for space, and p for points. Duration in the mind determines whether '…..' represent seconds or years in Einstein's Space-Time, as created with the earth-year and its sub-units. Space-time is in units only.

However, there are two very important points that require absolute clarifications. The first is that time may pass, say, in sleep or coma, when you are not even aware of it; but whenever you want to know 'how much time' has passed, is passing, or will pass, the answer can only be in mathematical units---so, in fact, time is known and used only in units. And, also, as stated above, the passage and continuity of time, sometimes known as the phenomenal and most religious 'mystery of perpetual time', is easy to explain as the succession of time units---year after year after year. The second is that it is not really necessary to refer to every space as "space-time" as astronomers and cosmologist do in all their suppositions thus falsifying most of their theories without realising it. There is a major revolution about time waiting to happen in cosmology and astronomy, perhaps even in physics as well because the quantum is time dependent thus making it

[174] For example, generally we do not know the duration of the orbit of Jupiter and the periodicities into which it's year can be sub-divided. For that reason they do not exist in our minds, we are not accustomed to them. But the human mind is familiar with the duration of the earth's year and its periodicities, or sub-units of time. Therefore we cannot divide space into the duration and sub units of the Jupiter year. But we can do so for the earth orbit, together with all of its sub-units, all the way to the second and the cesium units. An alien from outer space would not be able to do so without training.

something of our own creation if our time is uniquely our own.

If and when the revolution comes, many of what now appear as mysteries about the nature of time in general relativity will disappear. In both astronomy and cosmology, wherever the term "space-time" is used, the simple term space will do---in all cases. But, on the other hand, with reference to time, it is not the case that in every text where "space-time" is used the simple term 'time' will do. The reason is that nobody knows of the existence of time in general relativity which dominates astronomy and cosmology. When writers speak of time in general relativity they indulge in what I call "the illogical transfer of our time" to metrics other than the special relativity frame for which it was invented.[175] No one knows of time anywhere else. Hence our earth time is instinctively carried in the head to other metrics (or frames) against the rules in special relativity.

It seems to some writers that once there is "Being" (Events and Processing), time is automatically implied everywhere, that is, in every space. Hence it is wrongly supposed that when space warps, as predicted by general relativity, time is warped with it, leading to bizarre consequences like time travel.[176] Or, in mathematical language, it is seriously proposed that, due to the ds^2 formula time is inherent in every space because of the Minkowski ict equation. These are misleading impressions. They form the basis of current cosmology that is why I think matters are not quite right up there, and that we should expect an imminent revolution in that field, perhaps in astronomy as

[175] I have already explained what is meant by 'invented time', namely, the act of linking the sense of duration in the mind to external mechanisms to create time in (or for) the clock. Strictly, this is time for this planet only. You will have to find external mechanisms in another frame to create time for that frame. In general relativity this is impossible to achieve. People just speak of time there---wrongly, I think---because it means they carry earth time in the head up there where it does not belong.

[176] Such writers love nothing more than portraying time dilation as something of a religious miracle, usually adding, 'as predicted by Einstein's theory of relativity'.

well. Almost everything done in these fields since Einstein has been falsified in some way by the use of the Minkowski formula, since it is 'fictitious and arbitrary'---in plain language, not a true representation of physical reality.

Time and space, without Minkowski, are separate entities. They were so before; and I insist that they are so after him, but not yet realised. The idea that they *now*, after Minkowski, constitute one entity to create 4-Dimensional metric in all nature is not logically correct. *I have no doubt that those who theorise with that idea are falsifying their theories*. We retain the term "space-time" *merely* to show that we know time to be impossible unless it is derived from space with points as a union between duration in the mind and external mechanisms, or repetitive cycles, exactly as confirmed by Professor Sir Arthur Eddington, and maintained by me throughout this book. It means we realise that time is space divided by points; that is the only way to get time as programmed into the clock. Time is "space-time" only in this limited sense. Time is not "space-time" in the sense that all space is space-time, and all time is also space-time in a world of 4-D geometry. This view of the world is so serious that I cannot understand why scientist cling to it even when they know very well that it is fictitious and arbitrary---in plain language, *false*. Time and space are not joined in that way at all. Minkowski was wholly wrong because he had to employ imaginary quantities to make them so---which obviously means that they are not naturally so united; and the cheek of calling the Minkowski space 'Minkowski universe' must now be abandoned as a matter of 'honourable' submission to the truth.

I have to mention again that Einstein was supreme; because of that we can use some of his own ideas as evidence that his support for the Minkowski ict equation was a mistake if only to prove that he was human! Take the proof for his light quanta hypothesis for example. The theory that all light was (and *is*) a stream of individual particles that needed no waves to propagate them was so revolutionary that it had to have solid logical (or physical) grounds to back it. We found the

proof in the photoelectric effect, for which he was rightly awarded the Nobel Prize for physics. But the technical *evidence* of how Minkowski equates space to time and joins them into one entity (a much more serious affair), is stated by Einstein himself to be as "*realised or at least thinkable*". That, certainly, is not logical thought, and philosophers are entitled to point it out. The irony is that Einstein's original idea of space-time (or local time) as 'time pure and simple' makes the complete abolition of the term "Space-Time" impossible. It introduced the new idea that time is "space divided by points"---any space at all.

So I have decided to label the Minkowski space-time ST_A. The original Einstein space-time I call ST_B. To my mind, Einstein was too generous to Minkowski since ST_A is false, but ST_B is quite true: time is space divided by points to accord with duration in the mind "in specific periodicities"---i.e. time units of various lengths. Again, "If cosmic time is abandoned, what is really measured by a clock?" The answer is to be found in the concept of ST_B. The Einstein space-time does not measure time. It creates it discretely from points as applied to space, any space, however defined. Minkowski missed this insight, for any cycle such as the year, once created, becomes a separate entity. Space is required for the creation of the sort of cycles we use for time, but once created with points from the fabric of space, the cycles become independent of the space and the points, too.[177]

[177] Let me forestall any attempt by mathematicians to rescue the Minkowski theory by claiming that it implied a natural union between duration and external time. We cannot have two unions for one entity in one theory: time and space is one union. Time and duration is a contrary union, which negates the former.

APPENDIX I

Time and quantified time[178]

We are all fond of using the word 'time' loosely to refer to the passage of existence in any form whatsoever. That may be called 'the unscientific' notion of time. In logic, science and philosophy, however, time is what Professor Richard Feynman called 'how long we wait'. This translates into the concept of 'how much time', or quantified time, so as to be able to tell how long we wait in mathematical language for universal application.

In a serious discussion of time, it does not make sense to just mention time. The context of any proposition (in science, mathematics and philosophy) must always state or imply the sense of 'how much time' in it, or expressly show the quantity of time proposed. Of course, time may pass when one is not conscious of it. But in all cases, when one wants to know how much time has passed, or will pass (as in futuristic propositions), mathematics must be used to quantify the time. And let me stress again that we quantify time by the use of external cycles in union with any sense of duration of anything whatsoever.

Quantified time is 'time in a clock', any clock at all. And the clock, any clock, can only show time as independent of space. Space-time is automatically quantified as it is derived from space with points, which is the only reason for calling it 'space-time'. Discrete time can only pass through the succession of the individual units. On this point, Leibniz was absolutely right when he said time is succession. What was

[178] These Appendices have been designed to go over the essential points in my argument.

lacking in his day was the concept of discrete time; with this new concept in our post-relativity world, we can now see clearly as to how time passes and seems continuous through the succession of its separate and individual units: second, second, second; or minute after minute after minute. Plus the hours, weeks and months all the way to the year, which also passes in the form of year after year after year.

It may seem surprising, the springs of a thousand legends, giving rise to supernatural speculations, that we have an extremely ingenuously smooth time system, so cleverly structured that it is there when we are born and there as we die, and always passing by. For this reason we know that "Time does not wait for anybody", not even Kings and Queens and Presidents. Even surrendering one's Kingdom and all possessions for a moment of time cannot save the most powerful Queen on earth. Scrutinised under a logical gaze, however, time is not so rosy; it is only one moment, repeated to pass by and seem continuous so that arithmetic can be applied to its accumulations. This, as we know well, happens when we reckon time for futuristic planning, and backwards as history.

But for the union between the sense of duration and external cycles giving us units of time out of the moments of time, time for the clock would not exist at all. Presently philosophers see time as rather a straightforward pragmatic entity, albeit not as simple as it is normally supposed. It is partly a confidence trick, which makes the clock work continuously, the trick of continuity is in the repetitions of the seconds, or of the units of time, all of which are to be understood as single moments--- which are the realities--- of quantified time. It is also partly physical (using physical cycles for the process of quantification); and partly philosophical, i.e. according to Einstein without time physical reality is indecipherable, or cannot be properly (accurately) determined.

WHAT IS MEASURED BY THE CLOCK?

Our time is based on the repetitive orbits of the sun by the earth, and evidently the earth never stands still. If ever it does stop going round the sun, our time system will be completely nullified; but, of course, life will go on. It is inconceivable that all life will be extinguished instantly the moment our time is (mathematically) nullified in the sense that only quantified time would be lost. This is the best proof there is that life is not based on "time allowed", as the religions portray it.

All the religions speak of "time allowed" for the duration of a man's life. They had to, because the nature of time is easier to explain as a providential bounty than anything else. To be honest, without a cosmic explanation for time, what is time, or, to put the question in another form, what is the origins and essential nature of time? Of course it is assumed that the clock measures time---but from where? And what is it that the clock measures to give us time in the clock?[179] The clock maker will say he invented the clock to reckon time in the sense that everybody knows---but what is that sense of time? It is a safe bet that no clockmaker has the faintest idea of the metaphysics of time in nature.

When it is postulated that general time permeating the whole cosmos (and therefore the same everywhere) does not exist, the first implication is that every body has to have its own time; it is not coming from the cosmos therefore it must have originated on this planet. So let's find out how it all began. That is the first implication. The second is that, as a result,

[179] Without the explanation that what the clock measures are cycles of duration, or duration reduced to cycles, metaphysically interpreted as a union between duration and its conversion to external cycles, time can never be logically accounted for. We will just go on using it---but in what form? In the form of units (year after year after year, and all the seconds and so forth derived from the year); yet that means the same thing, namely, a union between duration and its conversion to external cycles. For the year is only a cycle of the sun. It is not time. It is the practice of humankind to call it 'a year; and we use it as our basic unit of time, as a matter of convenience. Otherwise in nature it is not time. As a matter of fact, we can use something else---we can tap the finger, for instance.

cosmic time is abolished---although it sounds tautological, it still has to be emphasised, as well, and most clearly because the 'cosmic time instinct' is permanently ingrained in the human mind. One reason is that time cannot be suspended; but the more cogent reason is sheer intellectual incompetence plus fear of the unknown. We are always using time and so it does not make sense to just insist that it is not there. If it is there, and did not come from the cosmos, how did it begin? And the obvious fact is that it is *always* there. Even before we are born, and also as we die to leave it behind. *Yet it cannot be supposed that each body's time is a version of something 'naturally existing', whether it permeates the whole cosmos or not, with the necessary but illogical (little 'academic') proviso that it may not be the same everywhere but varies with individual bodies in accordance with unknown natural laws*.

It is plainly evident that this erroneous sense of time dominates scientific thought. That is the reason for bringing it up. Hence time is not defined in physics; and as a result, the Minkowski fiction makes sense to some scientists, including even Albert Einstein himself. So far only Professor Arthur Eddington has redeemed physics by warning that it must never be forgotten that the Minkowski formula is "fictitious and arbitrary"---but they have chosen to ignore him.

Thus Russell's query is important, namely, "If cosmic time is abandoned, what is really measured by a clock...?"[180] My answer, of course, is that outside the union between the sense of duration and its conversion to external cycles, time does not exist to be measured. *The very act of 'measuring' is the time in essence---like moving from point to another point, time is going, so that time becomes 'relation between points'*. The cycles are time units (the years, for instance), and the time units constitute the time: a year is a cycle, but it is our time, the basic unit out of which all other units are derived.

However, the cycles are the creation of man for the sole purpose of converting the sense of duration (of any thing or

[180] ABC of Relativity, Ch. 4.

any event, like the period it will take to reach the village from the farm before nightfall to avoid predators), to his time units to guide his activities. So the clock does not measure time; it rather reproduces units of time programmed into it repetitively---second, second, second, and so forth.

It should be remembered that the seconds are put there by the clockmaker; but where do they come from? The answer is that they come from the subdivisions of the year. Otherwise the time does not exist anywhere to be measured---the units constitute the time. Without the year there will be no seconds, and the like, all of which are derived as subdivisions of the year. As hinted above, you can even dispense with the year and its subdivisions and tap your finger, if you will not get tired. A million taps means it is time to go to bed, and so forth; outside the units of time, time does not exist to be measured; but the units are the creations of man as quantified time to record the passage of existence in his experience in manageable units for cultural purposes.

APPENDIX II

The principle of mathematical equivalence

The principle of mathematical equivalence to physical reality was mentioned briefly in Chapter Four. I now wish to state clearly the "metaphysical" rule in this Appendix.

In nature there is reality and our perception of it. In the word 'perception' everything man does in life is implied, including mathematics, since we can only act by perceiving the true nature of the physical world; I am using the word in a sense akin to 'experience'. The problem is, mathematicians normally are permitted to imagine things to satisfy their nostrums, so that they do not rely solely on their percept; however outrageous, they can defy reality, logic and common sense, and leave it to the applied mathematicians (physicists, astronomers and cosmologists) to find out whether what they have assumed is there in nature so that their theories based on it can be seen as true or not. In no other profession is this sort of thing allowed. Even one of the greatest mathematicians Britain has ever produced, Professor Sir Arthur Eddington, criticised that common mathematical tendency in his book, *The Mathematical Theory of Relativity*. I have quoted him above in the text, but it will do no harm to repeat it as it is vitally relevant here. He said: "The pure mathematician deals with ideal quantities defined as having the properties which he deliberately assigns to them. But in an experimental science we have to discover properties not to assign them…" The principle of mathematical equivalence should make them think of the practical consequences of their imaginary properties, although I doubt it, but that is another matter. The rule is that mathematics should not seek to make the basic features of nature what they are not quantitatively; any such propositions

are bound to falter. Note that we are talking only of basic phenomena. By the very nature of man, it seems he can make qualitative changes in peripheral nature not quantitative changes in the fundamental aspects of nature, and time is the second most fundamental feature of both nature and life.

The principle means that, in effect, one cannot use mathematics (sometimes defying comprehension) to state, say, that there are ten trees in a field, and propound theories about them if, in actual fact, there are only two. This is slightly different from assigning imaginary properties to nature. It is different because it relates to 'quantities'. Six into four won't go, or something like that. The principle of mathematical equivalence rules that, to accord with physical reality, one can only talk about two trees, or as things are not as the mathematicians want them to be. Nature is not there for the convenience of mathematicians; it is neutral. That was the advantage we gained when the ancient teleological interpretations of phenomena was discredited.

It is not often realised how progressive is the study of philosophy. Quietly but surely, many entrenched myths from our primitive past are being discredited one by one by philosophers. One of them is teleological argument. With that and many other ludicrous intellectual fashions out of the way, it is unacceptable to regard any concept as 'compounded for the convenience of the mathematician', as Russell defined the Minkowski theory of space-time. Some day, we may get scholars writing about the many myths philosophers have discredited through their quiet researches to foster science and progress generally. So I regard this principle of mathematical equivalence as a strict and necessary doctrine to prevent mathematicians arrogating the power and right to alter nature quantitatively in the fundamentals of physical reality. We shall, and should, continue to alter nature qualitatively to our benefit---gardens, buildings, roads, cities, waterways, canals, railways, bridges, tunnels, all science (bar destructive devices), and all art, sports and so forth. They do not change nature but beautify it; but quantitatively, never. We cannot

make one object two, or two objects one, physically. It is not possible realistically. Not in reality only in the imagination. The only one I know of that has achieved any kind of academic adherence in the strictly rational post-relativity era is the Minkowski formula, but then it is regarded as fictitious. Thus mathematicians who rely on it must know that they are falsifying their nostrums.

The origin of the rule will help the reader to understand it well when spelt out: it occurred to me when I was pondering Hermann Minkowski's claim to have made time and space into one entity as from the moment he outlined his theory, as previously quoted, in the following smug (even cheeky) statement: "The views of space and time which I wish to lay before you have sprung from the soil of experimental physics, and therein lies their strength. They are radical. Henceforth [that is, from the moment of his lecture] space by itself, and time by itself, are doomed to fade away into mere shadows, and only a kind of union of the two will preserve an independent reality".

This is to usurp the almighty power to make two things in nature into one with mathematics ('a kind of union of the two…') So he knew they were two independent things. How could he have made them one from the very moment of his lecture? He spoke of experimental physics. In fact, the only experimental evidence pointed to time being 'local' in nature; and Einstein adopted it in his special relativity, as a separate entity from space. There was no suggestion that time had been found to be inextricably intertwined with space---rather the suggestion was that time could not be had without space; and that once you have space, you can create your own local time. What Einstein did was to interpret local time to mean "The only Time" we can have.

The actual physical reality known to be in existence was precisely as Minkowski himself stated it---namely, that time and space were two separate things. But it is interesting that he sought refuge in experimental physics. In that sense he did not breach the principle of mathematical equivalence. It shows

that he was really a very good thinker; he had to be that good to convince Einstein to adopt his formula for general relativity, which came ten years later. The unfortunate thing for him is that the evidence he cited was really irrelevant to the claim he was making. He needed physical support that time and space are inextricably intertwined and therefore constitute one entity. The evidence that had been discovered by Lorentz and Einstein was that time was essentially local in nature, leading to the supposition that 'there are as many times as there are bodies', and that, additionally, time is different in different places, and also under different conditions. The principle of mathematical equivalence can be used to refute Minkowski's claim to have made them into one entity as from the moment of his lecture.

The rule stipulates that he should only have spoken about time and space as they actually were in physical reality, which, he has admitted, were two separate entities. The reality before Minkowski was that there was space, and there was time. Even the great Einstein himself made them independent in his special theory of relativity. So it did not surprise me that Professor Sir Arthur Eddington and Bertrand Russell described the Minkowski proposal as arbitrary and fictitious. However, it did surprise me that mathematicians ignored this strong condemnation to claim that they could not understand Einstein's ideas without the Minkowski fiction.

This made me sit up and think, think of a principle to require mathematicians to relate their suppositions to exactly the nature of physical reality laid out before them, not as they would wish it to be to accord with their nostrums. The result is that I came to the conclusion that mathematics can only mirror reality, *not to alter it with mathematics alone*. So the principle of mathematical equivalence is this: Mathematical statements (or equations) must strictly accord with physical reality. It means no mathematical quantity can exceed or reduce what the actual physical quantity is. No mathematics can make one thing two, or two things one, without physical divisions and unions. Referring to Minkowski, he failed the test of "physical

union" because, as Professor A.N. Whitehead has pointed out, time and space *still* pass through nature as two entities, not one.

APPENDIX III

Why space on its own is not "space-time"

In Einstein's special theory of relativity, we learn that, "In the absence of gravity, space and time are distinct entities. In the metric of special relativity they play distinctive roles."[181] Nothing in special relativity has changed since then to make all space "space-time". Yet in all their suppositions cosmologists and astronomers always refer to space as space-time.

Let me set out the facts as they are at present, as argued all through this book, and hope they will see the light. To begin from the proper beginning, the whole idea of space-time comes from H.A. Lorentz; until then space was space and time was time. It is true that in special relativity Einstein made space and time dynamic rather than the Newtonian absolute; but being dynamic merely means they are changeable under different conditions. But about time alone Einstein avers that he was able to complete special theory of relativity five weeks after he gained the insight that the Lorentz idea of 'local time' can be defined as 'time, pure and simple'. So let us examine the Lorentz notion of local time.

H.A. Lorentz found that time runs slower when in motion, known as "the dilation of time as a measure of moving clocks". It was never a real problem since only those outside noticed it; but this was the pre-relativity world of classical physics; things were different. Time was supposed to be the same everywhere and in all conditions---this is a very important point in this debate. In the mean time, Lorentz could

[181] Professor Jeremy Bernstein, in *ALBERT EINSTEIN: and The Frontiers of Physics*, Op. Cit. p110

not understand why and literally put it aside. He called it 'local time' or t^1. To him it was not 'the true time' but a mathematical auxiliary or curiosity---not very important. Time, he said, was time, denoted with *t*, and t^1 was something you get as your local time, but certainly not applicable in the outside world as time, because it was a mere mathematical curiosity. May I remind the reader that all this has been given in detail in the text above. I have even mentioned Lorentz's own statement that he thought he failed to discover special relativity because he did not regard time dilation as of any importance.

Strangely, however, as one of his brain waves, Einstein worked this into his theory of frames. The dilated time was 'local time'---the time of your locality. Now, if the universe was fragmented, then local time would be somebody's time, which to him would be running normally like any other time, but to outsiders, would be running erratically (or slowly, in this case.) In actual fact, that was the case with the Lorentz discovery. People outside the moving clock would see it as running slowly; but those carrying it in the moving vehicle would notice no difference in its performance. That is the genesis of the Einstein theory of frames. Otherwise time was separate from space. What you will find is that it varies under different conditions, simply because everybody has to have his own 'local time' in his locality or inertial frame.

But since time is continuous, and having made it a separate co-ordinate in the study of phenomena, dynamic space would have different time co-ordinates at every turn. We recall that Bertrand Russell has stated that from the sun's point of view the tram never repeats a former journey---because the time co-ordinates would be different. Since time is a separate co-ordinate in the determination of physical reality, different time co-ordinate implies a different situation, different physical reality.

This was the state of affairs when Hermann Minkowski came in with his theory of 4-D geometry making time part and parcel of space---all space. So that cosmologists and

astronomers call his theory "The Minkowski Universe", meaning that all nature is subject to the 4-D geometry, where time and space constitute one entity. But let us swiftly add that the foremost mathematical interpreter of relativity was our own Professor Sir Arthur Eddington, the man who confirmed the general theory of relativity. He wrote the definitive book on relativity, called *The Mathematical Theory of Relativity*. About the Minkowski 4-D Geometry, he stated clearly on Page 9 (Ch. 1.1.), as already quoted, "*Such a mesh-system is of great utility and convenience in describing phenomena, and we shall continue to employ it; but we must endeavour not to lose sight of its fictitious and arbitrary nature*."[182] He was not the only great mathematician who described the Minkowski formula as arbitrary. Bertrand Russell also said it was based on arbitrary assumption. As quoted in the book, he made it plain that because of that the derivation of the Minkowski 'interval' as time from space was illogical, or invalid.[183]

Let me try and explain again the reason mathematicians still adore the Minkowski theory, even though they know that it is not true of the physical world---imaginary time does not exist anywhere. The reason is this: it makes things easy for them. They accept the novel Einstein notion that time must be made a distinct co-ordinate in the description of phenomena. You see, the problem is that Einstein made all time (any sort of time) 'local time'---the time you create for your own local purposes, as Lorentz had discovered. Einstein extended the Lorentz idea to all nature.

[182] The emphasis is mine. I have had to mention this several times, because, quite honestly, I am outraged by the mathematicians' desire to perpetuate the Minkowski formula as if it is really true of physical reality---yet it is not, and they know it. At least one of their own numbers told them so.

[183] The Minkowski interval cannot be given a time value (say, second, minute, etc.) To do so it is necessary to use sub-units of the earth-year; but that will show time as completely independent of space---there is no mathematics to overcome this difficulty which, to my mind, is a major hindrance.

With the universe being fragmented, it was impossible that one system of 'dynamic time' (as opposed to 'absolute time'), would apply with equal validity to all fragments of the universe. As a result he said there are as many times as there are bodies in the universe. Nobody can contradict Einstein on this matter. But mathematicians found that creating your own time to add to phenomena to acquire your concepts of physical reality puts too much power in the hands of mankind. (I suspect there are religious sentiments in this.) Besides, it was complicated. The Minkowski system was easier; you just have to mention the Minkowski space or ds^2 and move on. It comes with time already embedded in space as part of it---so the whole of space is 'space-time' and every time is also 'space-time'. The caveat of Professor Eddington was quietly ignored. Soon everybody forgot about this; Eddington and Bertrand Russell were dead; and there was nobody clever enough to notice the discrepancy and question them about it. Of course, that leads to a distortion of relativity, but mathematicians are the arbiters of truth in mathematical physics and they were the ones benefiting from the Minkowski theory, and therefore preserved it. Otherwise it is not true that all space is 'space-time', while all time is also 'space-time'.

Yet it is true that time is always space time. You cannot have time without space; not because the space comes with time inside already, but because all time is known and used in units and in units only, which can only be had by the application of points to space.

There are elements of time in the mind as the internal sense of time, known as the sense of duration. But we have got to link duration to external cycles to give us usable time in units. For example, without space we cannot have the year; yet the year is our basic unit of time out of which all other units are derived. This brings a little complication but nothing serious. The reason is because you can only create time, as 'intervals', or as 'time units', with the application of points to space, thus making time a product of space, and therefore 'space-time'. It makes time necessarily discrete, being the product of points. Therefore time is always 'space-time, or properly '*space-*

timed'. But that is all the connection between space and time, except that space is required, again, for displaying time in units as we have in the clock.[184] Under relativity the clock, any clock, does not give 'flowing time', as stated by Professor Eddington. It merely reproduces units of time programmed into it. The old mechanical clock based on coiled springs gave the best illustration. The springs are manufactured to release units of time: second, second, second. If one failed to rewind the springs, the clock stopped ticking. The springs provided the clock's energy, but they were strictly programmed to reproduce time in specific units only.

After the time is derived in this way, it becomes separate from both the space and the points used in creating it. That is why Einstein made them separate entities in special relativity. For, apart from the condemnation of the Minkowski 4-D geometry by Russell and Eddington, Professor A. N. Whitehead has also pointed out that time and space *still* pass through nature separately---not as one entity. To add to these, I have humbly suggested the Principle of Mathematical Equivalence above, which can also be used to denounce the Minkowski arbitrary formula.

[184] The poignant question posed by Bertrand Russell comes up again, namely, in the absence of universal time, what really is measured by the clock? (ABC of Relativity, Ch.4.) This is a very serious matter, because if cosmic time is abandoned, there is no time, or any logical explanation for the time we have. The answer, of course, is that the clock does not measure time. It is deliberately programmed to *reproduce* specific units of time: second, second, second, leading to minutes and so forth, to accord with the cycles of the earth, so that about 31,536,000 (or so) seconds will coincide exactly with the earth's orbit of the sun, called 'one year'. To have more years, we go round the sun again and again and again---hence perpetual time. Units of time in procession give us continuous time. From the Einstein concept of space-time we know that time, since it is produced with points, has got to be wholly discrete.

APPENDIX IV

The misconceptions of time in relativity

It must not be supposed that the problem of time in relativity has been conclusively settled. Relativity is physics. When a problem is solved in physics the solution is always clear, precise in mathematics, and universally applicable; but time in relativity at present is very vague, neither definite nor precise, not least because consideration of time is a philosophical enterprise. My principal argument is that the original Einstein theory of time can be used to solve the passage and continuity of time.

Unfortunately, Herman Minkowski made the question of time in relativity immensely complex and vague, not at all like the original notion proposed by Einstein. Indeed, as a result, the question of time, on the whole, is destine to keep the philosophers busy for several centuries as their nostrums become footnotes to Einstein instead of Plato. As regards the physicists and cosmologists, as opposed to the philosophers, they believe that the Minkowski theory makes things easy for them; the problem is that it is just not true of the physical world. The Minkowski intervals need to have time values to be valid or usable. Yet there is no way of doing that without having to divide space (chop-up the earth-year, for instance), which will completely destroy the theory's premise.

Bertrand Russell has said the concept of space-time is perhaps the most important theory Einstein introduced. To me, there is no doubt (no 'perhaps') about it. It is the most revolutionary theory in human history simply because time is second in importance only to life itself---and yet that life cannot even be lived as a well-organised existence without time. That is how momentous time is in human affairs; and Einstein has shown

that it is very different from what it has been traditionally assumed to be. Secondly, he insisted that it should be taken as a separate coordinate in the study of phenomena. In the determination of physical reality, because of Einstein time is a co-ordinate in its own right just like the height or length of matter and space are, thus making Man, the observer, part of the observed, since he has to add the time in the 3+1 formula. Those mathematicians who assume, on the Minkowski theory, that time can be incorporated into space with mere mathematics so that we can dispense with the 3+1 formula and the metaphysical role of man in the determination of physical reality, are contradicting Einstein, which is something approaching a hanging offence in science. On the contrary, it is possible that the passage and continuity of time can be conclusively resolved with the original Einstein theory of time as space-time, or local time.

There is obviously fear in some powerful quarters that time cannot be something we invent by ourselves. But course, if 'there is no longer a universal time' we have to find out how we get our time.[185] However, nobody is claiming that man invented the whole of time. Rather we have found that we invented how to quantify time by linking the natural sense of time as duration in the mind to external cycles. This sense of duration of anything is obviously connected with the memory mechanism for the retention of images and concepts in the mind.

Let me stress again, and more strongly, that the seed or seat of time is duration in the mind. In his *Mathematical Theory of*

[185] It is not often realised that philosophy is of great importance to science; and, as an example, this is the sort of thing philosophers do behind the scenes to make their suppositions indispensable to science in general; for the philosophers service every branch of science. The phrase 'survival of the fittest' from biology which has passed into general usage in science and linguistics, was coined by a philosopher, not Darwin. All the sciences need philosophical interpretations. In the quotation above from Professor Dingle, he was saying this very strongly in respect of physics; but all the sciences need the same sort of assistance from philosophy, including even mathematics and logic.

Relativity, Professor Eddington made this absolutely clear, as quoted above; and we have got to take that view seriously because the theory of time outlined in this book is based on relativity. Unfortunately the mental sense of duration is not enough. It cannot give time for general use because it is private. The word 'time' is meaningless until it is objectively quantified. We need time in units to apply to the external world---i.e. to mechanise in the clock for general use, so as to be able to tell 'How much time' at a glance---see Appendix I above. This is achieved with external cycles, the most basic of which is the earth-year out of which all other units of time are derived with mathematics. And it is maintained that this is in complete conformity with the Einstein notion of time, and therefore incontrovertible. Above all, it is the only means by which we can logically solve the problems of the passage and continuity of time.

For now, we are told in all earnestness from the discussions above that relativity is not properly understood. This may be so; but actually relativity is only a theoretical system, a suggestion. It is based on the suggestion that physical reality is not homogeneous but fragmented, and therefore subject to different natural laws. This applies to both special and general relativity. Bertrand Russell called it 'a logically deductive system'. In plain language, 'a new philosophy of physical reality' so logically structured that it demands attention, respect and serious study. And these Einstein has certainly achieved. With Einstein alone we are not talking about genius but a godlike intellectual phenomenon never seen on this planet before; he reconstructed the world of physical reality single-handed, that is the reason he is indispensable to both scientists and philosophers.

So Bertrand Russell was absolutely right. Einstein's system is a new logic of physical reality, and it works. But theoretical physics is most unlike the physics we apply in laboratories. Ordinary physics is much more like chemistry; it has consequences. The Nobel Committee was right to award Lord Rutherford the Prize for Chemistry, even though he regarded

himself as a physicist, who had rather cheekily claimed that "all of science is either physics or stamp collecting"!

In theoretical physics there are no obvious consequences, so it is difficult to judge the merits of suggestions. Instead, when we get a new theory in advanced physics (rightly or wrongly), three things will happen. I mean, all three will definitely happen in succession, whatever may be the merits of the new proposal. First, we will get interpretations of the basic postulates proposed in such complex settings (or confused formats) from rival theorists that the debate just has to go on; nothing will be settled in the meantime. But because there are no consequences, nobody will get hurt, no machinery will fail to function; avoidable calamities will not occur. The rains will not stop; the sun will not dim.

The most recent example was the eather debacle (or debate). Secondly, we will get accusations and counter accusations of misrepresentation. The third possibility (because philosophers share with theoretical physic one subject-matter, being the determination of physical reality), will be philosophical interpretations to arrogate the almighty right to shame and discredit some of the factions in the debate, only for philosophers of different schools to turn the tables---and so the debate will be carried on and on. These philosophical discourses are often quite profound, giving several intelligent interpretations without being able to settle the argument one way or the other. Strangely, that is how we eventually acquire our knowledge of the external world, sometimes referred to as the practice of 'academic freedom'. That is what happened to Plato. And that is what is happening to Einstein as he has come to replace Plato, in fact, to make his basic suggestion redundant, if not completely false, due to the quantum theory.

A careful examination of what has happened to Einstein's theory of time so far betrays elements of all three reactions. We are told that 'most definitely' due to Einstein's analysis of 'Order and Simultaneity' there simply is no 'standard or absolute time frame in the universe'. ('Time Frame' or 'Time Reference' means the same thing. It means the logical

criterion of validity.) This is generally accepted as true; for it is reinforced by the Lorentz time dilation and local time concepts.

However, it implies that time in the abstract is utterly indefinable, as I have shown above with discussions about the earth-year.[186] The year is indefinable; other time units in use on earth are defined in reference to the year. But the year on its own is logically indefinable. Again, all our time units, down even to the cesium units, are based on the earth-year; they are meaningful only as related to the year; but like the year, on their own (that is in the abstract) none of them can be logically defined. How long, for instance, is a second in logic without reference to something else?

The result is that we all have to use the clock, or clocks, based on the earth-year. By this theory of time (as quantified time), the human intellect is built upon the concept of "points" only. Instants do not exist independently in nature. Only points do; they had to be discovered by man, but they do exist in nature independently—for example, trees constitute points. Before we learnt to put points on paper, we could see that trees dotted the landscape. Thus points constitute the basic instrument of human thought, especially in mathematics from which all the sciences spring.

The instants arise from the act of 'consciously' and 'purposely' moving from point to point, confirming the Russellian notion that time is 'relation between points. Hence quantified time is human in origin, except that the internal sense of time (as duration of anything in the mind) must be recognised as making a psychological contribution to the invention of quantified time in that the external cycles used for quantified time (the years, for instance), have to have

[186] Since no one can define time in logic, there is no possibility of getting, say, the second in other frames---i.e. without reference to the earth-year. Yet any other 'year' will not do, and using the earth-year outside the earth is also banned.

psychological anchors (meanings) which are the senses of duration of anything in the mind.

Secondly, in the absence of a standard time frame, what does it mean to claim that time intervals in a moving frame are shorter---shorter as against what kind of standard or universal time? What time intervals are they compared with since there is no standard time frame? (Note that you cannot say they are shorter as compared to other clocks outside the moving frame; that will bring in the Einstein theory of frames, as I will discuss presently.)

So we all, in the end, have to resort to using the clock or clocks based on the earth-year. Yet if we use the clocks then it is not correct to claim that time intervals in a moving frame are shorter; they are not naturally or normally shorter (in their proper settings) or longer either; they are *normal* to that frame, or to their natural frame. The moving clock may only seem 'different' as *viewed* from the outside; but if that is the case then there is no puzzle.[187] The time of the moving frame is not 'our' time; and it is not queer to its natural environment or setting. It is a strange phenomenon to those looking in from the outside, in breach of the Einstein theory of frames.

The whole idea of studying other frames from the outside is fraught with difficulties; it can never be an exact science since the standard postulates that make our system work (and make it what it is) might be inapplicable outside our frame, or planet.[188] Speculations into other frames from our frame have

[187] Otherwise it is difficult to see how the behaviour of one clock can affect all time, human physiology and even the material contents of atoms, e.g. muons. If time is defined as the passage of existence in consciousness, how can the behaviour of one clock affect it for all of us? There are still a lot of religious beliefs about time. Time dilation is one of them, so sweet to the religious in science because they can claim that "it is a unique mystery about time predicted by Einstein". In fact, it is not a mystery, let alone predicted by Einstein: he rather solved the little problem with his theory of frames—i.e. the dilated clock belongs to another frame to which it is running normally.

[188] I think one implication of this is that the laws of physics, or some of them, would differ from ours at least in some parts of the cosmos, if not all

been responsible for all the bizarre suppositions about time and space-time from mathematicians and cosmologists in general relativity. I don't think that kind of enterprise is justifiable, especially when it leads to theories that space-time may be infinite in its timelike directions. Space-time cannot be infinite because it is necessarily discrete---the year, for instance, is not infinite. It is only one; all other units of time derived from the year are also discrete and individual. The proper way to think of time as space-time is that its units are in perpetual procession (one year or second following another) to make time seem continuous; as such time can never be infinite.

Nothing illustrates the confusion about time in physics as a result of relativity and how it is misunderstood by scientists than the story of muons. By normal logic they should not last long enough to reach the earth; but they do. With the use of formulaic mathematics and concepts, physicists explain this by saying special relativity provides the answer as follows: the speed of muons is so great that their internal clocks slow down. Using the theories of time dilation and the so-called twin paradox based on it, it is assumed that as the muons speed and their internal clocks slowed down they aged less and thus are able to last long enough to reach the earth. To a logician or philosopher who understands relativity, this is so laughable as to choke him. It is really the best example of the confusion in physics about time in relativity. (1) Time dilation has nothing to do with the muons and how they behave, since time does not dilate internally. Lorentz found that a moving clock would be seen by outsiders as running slowly; but internally those carrying the moving clock would notice absolutely no difference in its performance. Einstein explained this with his theory of frames---the moving clock is in a different frame. There is no logical mechanism for this kind of episode to be able to control time *per se*. All other clocks

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over. Einstein was really a very strange genius in physical thought. He introduced the notion of postulates for natural laws in frames. This idea may go very far indeed in the cosmos at large.

would not run slower or faster; and since there is no such thing as absolute time frame, or a standard time, by which all other clocks can be compared, the moving clock's performance has no relevance at all in physics, because its carriers would notice no anomaly; and those outside who notice any anomaly should mind their own business since it is not their time. (2) The idea that muons have internal clocks is based on the Minkowski theory of space-time, where space and time are assumed to constitute one entity; and therefore the reasoning goes that, since the muons occupy space, and all space is space-time, they have their own internal clocks to keep or measure time for them. Again, any logician will describe this as nonsense; for after all, the Minkowski space is known to be fictitious and arbitrary with absolutely no logical validity.

The basic idea in Time Dilation, which all these writers rely on, is easily disproved thus: we know there are (roughly accurately) specific times by our normal clocks for the occurrences of certain events on this planet. Let us use Sunrise and Sunset for illustration. If Sunrise is usually 6 am, and Sunset is roughly 6 pm, as they are in some countries in the Tropics, it is inconceivable that a moving clock can force or influence these times to become 7. am, and 7. pm, on the planet just because that particular clock is running an hour late---simple. "The dilation of time as a measure of moving clocks" can in no way influence all time *per se* on the planet. It affects the performance of only one clock. Clocks are manufactured to reproduce specific time units, usually in seconds. If a particular clock, for whatever reason, is running erratically, there is no logical mechanism for its behaviour to affect all other clocks on the planet.

The real metaphysical importance of Time Dilation is often overlooked by mathematicians. Of course mathematics is important, as 'Queen' of the sciences; but I fear that mathematicians tend to disregard the contribution of some philosophers. Not all of them, I agree. One of the great achievements of Bertrand Russell consisted in showing what was good in the History of Western Philosophy. There are

good philosophers, bad ones, and dangerous, almost mad ones. One of the best was David Hume; another was Ernst Mach; both contributed to Einstein's ideas, according to him, 'greatly'.

So we arrive at the stage where we can comment on the importance of the work of mathematicians in the interpretation of relativity, since Einstein succeeded in creating a completely new world of physical reality. The work of mathematicians should never be overstated, but mathematics will always be indispensable in all things to do with physical reality. However, in our present enquiries and discourse, using mathematics to overcome differences between Einstein's Frames of Reference is only a practical issue, much more like the practice of preparing food (out of raw ingredients) to make it palatable. It is a functional problem. It is not a serious matter of philosophical significance. But the fact that there are these differences at all, the fact that Einstein was able to educate us of them, the fact that physical reality is not a uniform entity such that one physical theory can be applied with equal validity throughout the universe, seems to be as important as the air we breathe. For a start, it means there has to be differences about time between the sectors of the fragmented universe as well, if, as he found, time is not general or absolute, but variable. Besides, for myself, I am not so sure that differences between frames can successfully be smoothed over with mathematics alone in any meaningful manner: mathematics can only reflect reality; it cannot alter it quantitatively, as argued above.

The reader will have noticed that the name of Lord Bertrand Russell comes up regularly in all discussions of relativity's interpretation. It is unavoidable. Russell was highly respected by Einstein, and for very good reasons. He was the greatest philosopher of the time. He was also a great mathematician and logician of genius. A most attractive writer, who won the Nobel Prize for Literature, he wrote about every subject in philosophy, including novels to illustrate moral points. When relativity was announced, he abandoned many of his most

cherished ideas as wrong without shame or even mild embarrassment. He probably enjoyed it. He was candid and honest in the most adorable way, completely dedicated to the truth no matter how it reflected on his own beliefs. Russell probably had no certain beliefs other than the pursuit of the truth wherever it took him: via science, logic, mathematics or plain common sense, and linguistics. If he was certain that teaching mathematics to people from the cradle could save the world, he would have advocated that as his philosophy.

Concerning relativity specifically, in the later editions of his little book "Problems of Philosophy" he denounced his original philosophy as expressed in the book because of Einstein's theories, joking that whoever wrote the original ideas must have been a monkey, but nobody should suppose that the monkey looked, even remotely, like himself! No great philosopher has ever made such a confession; often associated with rulers, they all wrote imperious edicts as if they had discovered the final truth in logic and metaphysics.[189] Indeed, Russell later called his Fellowship dissertation "somewhat foolish" for the same reason, namely, the geometry used by Einstein had made his discussions of the foundations of geometry completely wrong, and he was happy to admit it and adopt the new Einstein theory. He wrote one of the best

[189] No surprise, then, that Russell later put them in their deserved places (mostly of dishonour) in his monumental *History of Western Philosophy*. One complaint is that he never even once mentioned the name of Wittgenstein in this great book. The reason came from his contemporary, Sir Karl Popper---it was because, "In the long history of philosophy there are many more philosophical arguments of which I feel ashamed than philosophical arguments of which I am proud…Russell saw these things in that light, and so did I…" (From, *Modern British Philosophy*, By Bryan Magee, Secker & Warburg, London, 1971.) In 1959 Russell published his book, *My Philosophical Development*, in which he said he eventually had to reject Wittgenstein because he was talking 'logical mysticism' which was anathema to his basic nature. Of course he was right. Correctly defined, logical mysticism includes religion, mysticism and unscientific gibberish, all dressed up to look like valid logical reasoning with a variety of linguistic trickery. Many aspects of philosophy in Oxford and Cambridge (and elsewhere) remain stuck in this kind of mud ever since.

interpretations of relativity, still in use, under the title “ABC of Relativity”. His book “The Analysis of Matter” can be divided into two. One section is about relativity; the other is mainly about his joint theory with A. N Whitehead to the effect that the world of sense is a construction, not an inference. Yet even this can be traced to relativity, since Einstein made man the observer part of the observed, meaning that man contributes something to the nature of physical reality---i.e. to help with the construction of that reality---and the book was published long after both special and general relativity. It is a moot point. For the Einstein theory was the 3+1 system. The three facets of phenomena are natural; the time is, in Einstein’s system, one’s own local time. It means one would have to invent his time as a union between the sense of duration and external cycles before having an “objective time for general use in one inertial frame” to add to the three natural dimensions of phenomena, to complete the construction of physical reality---or the physical reality relevant to one’s frame of reference.

APPENDIX V[190]

Reply to some critics on the web[191]

In the interest of learning, I am sending you the Appendices of my recent Monograph in which you will find all the answers you seek about my work. However, please understand that I am presenting a rounded philosophical theory about time, how it passes, and how it seems continuous in an attempt to solve the problem of perpetual time without the involvement of God---all of it based on Einstein's notion of time so as to link philosophy to physics by means of time alone. For a very long time I have felt that it has become possible to do so, either by time or by means of the quantum; particularly the quantum because it is the same thing as the light by which we see things, and also the beginning of human knowledge of the external world.

To be completely rational, epistemology can never ignore the quantum (which is also matter or small pieces of matter), especially in its role as the light by which we observe other bundles of quanta as bulky matter---a very intriguing phenomenon, or quandary, in nature. It cannot be ignored in any theory of physical reality, however conceived. To link it to philosophy is to abolish the philosophy that regards physics as 'just another way of looking at the world', and see it instead as the only way, rationally. Even the Platonic theory of Ideas becomes redundant because outside the quanta images cannot

[190] I am afraid, this Appendix is longer than I would have preferred, simply because my critics have to be treated with respect and answered in some detail. Discussions of ultimate reality cannot (and must not) be treated lightly.

[191] This is the corrected version of the piece posted on the Internet (in a hurry) as my reply to some critics.

exist; and the quanta are seen plainly as light---so we see how images are constructed, and by what means. The demise of Idealism is finished off.

Also, because the quantum is time-dependent (as 'energy-second'), I have made one or two comments about it. I don't think it can be the same throughout the universe because the time by which it is known on earth is peculiar to the earth---that is, provided all the universe is not subject to the 4-D geometry of Hermann Minkowski, *and therefore a second here is not the same as a second everywhere else in the cosmos, according to the original Einstein theory of time*. Thus refuting Minkowski is crucial. His intervention was more disastrous than mathematicians realise. If his 4-D geometry is true relativity is simplified. If it is not true, as we now think, then his intervention should be seen as causing unease in physics for no good reason. What I cannot understand is why mathematicians insist on using it, even though they know from Russell, Whitehead, and Eddington himself that it simply is not true of the physical world.[192]

As energy-second, the quantum's energy is natural---the time is not. It is our peculiar second; and I have discussed how we make our seconds on this planet at length in the book, suggesting that it could have serious implications for the Theory of Everything.

The nature of time may have a bearing on the Theory of Everything due to the following observation about time. First of all, since Einstein was not a 'professional' philosopher he

[192] I suppose the reason is to be found in the following requirements used by mathematicians to nourish their fertile imaginations: (a) Time in all space; (b) thus everything in space has its own time internally; (c) at great speed even sub-atomic particles have their time slowed to a crawl; (d) there is usually great speed in the atomic and sun-atomic world; thus infinite possibilities arise for bizarre conjectures. I agree that these are powerful incentives for holding on to a theory that is seen by the highest authorities in science and philosophy as plainly false---except that there are logicians and philosophers to police the matter and they are not easily fooled. So there is an impasse but the mathematicians refuse to budge. The only thing I lack is the ability to put this to music to make my first million!

did not attempt to give the logical grounds why every body in the universe has to have its own time.[193] Unlike mathematics logic is mercilessly dry, acute and uncompromisingly factual; everything must be clearly defined; all conditions and methods clearly spelt out. The Einstein theory of frames is used to justify the claim that time is limited to a frame, but the technical grounds why this is so have never been made clear. That is to say, the conditions in nature that make time limited to a frame have never been clarified. Einstein could not be blamed because he was not writing philosophy.

Let me state the 'necessary logical grounds' why time is limited to a frame in a clear language (without mathematics) for the benefit of the reader or readers: time must be quantified to be useful in science and logic---let us call it 'usable time'. It is meaningless to just mention time as such. Culturally we can only use quantified time, otherwise how could we mechanise it in a clock? Now, to quantify time we have got to employ external repetitive cycles (or regular motions) in association with the internal sense of time, which is the sense of the duration of anything whatsoever, to get our usable periodicities---or time in units; so that the duration is converted to time units, or usable time; until then, time (as duration in the mind) is not usable, and can be sensed only in the passage of existence, motion or silent ageing. These units of time then become unique and applicable only to the body concerned, the body whose cycles yielded them; it is from its cycles that the units were established and so they could not be appropriate to any other body. This is not useless nit-picking in logic, since on this interpretation of time, all the work of

[193] Note that Einstein qualified for the noble title of 'philosopher' for a number of reasons. For instance, the difficulties over the eather or the propagation of light arose simply because the nature of physical reality had been misconceived by both physicists and philosophers---this went all the way to the quantum theory. Only a great philosopher could solve such problems and make the solution part of mathematical physics, and not as an unproven supposition, or suggestion. I will give him the title of 'The greatest Thinker', not the greatest scientists. That honour belongs to Charles Darwin, no matter what religious bigots may say against him.

cosmologists in the supposed metric of general relativity is vitiated because they use earth time; yet without this interpretation how we quantify time cannot be explained.

I believe that attempts to conceive a Theory of Everything has also suffered from the use of earth time everywhere, when it is obvious that it cannot be applicable everywhere: we want to link the quantum to gravity. Yet the quantum cannot be 'a universal unit of energy' because it is time-dependent as energy-second. This must be taken into account, but it is not. Scientists just use the word 'time' and forget about its quantification and unique periodicities.

To get a fair idea of my supposition you will have to read my books about my theory, of which there are more than one. Failing that, these Appendices to my latest work will give you an idea of my philosophy. Please note that those aspects of the Minkowski mathematics you cited have no logical validity. I am questioning his basic premise. I insist that, *for time alone*, the *i* in his ict equation is not tenable; therefore his 's=ct…' and other deductions based on the ict equation are flawed.[194] There is no such thing as 'imaginary time'.

Mathematicians often forget that mathematical symbols must have causative meanings; but philosophers never forget that. It happens to be one of the obvious differences between

[194] At all times it should be realised that, despite the condemnation of some scientists, philosophy is important; believe me, it is very important. Einstein said he was influenced 'very greatly…' by David Hume and E. Mach. To get at what can be considered as the ultimate truth (or the truth for short, if you like), philosophers, unlike mathematicians, have to go to the roots (the logical foundations) of equations; merely repeating the mathematical symbols as written is regarded as shallow, at this level even an insult. Let me quote part of what Russell wrote about the Minkowski formula---and you cannot say Russell did not understand the mathematics of Minkowski: "…the philosopher cannot but feel dissatisfaction with the apparently arbitrary assumption about intervals…" And again, "…there is great difficulty in suggesting any non-technical meaning for interval; yet such a meaning ought to exist, if interval is as fundamental as it appears to be in the theory of relativity…" (Bertrand Russell, *The Analysis of Matter*, Ch. Xxxviii.)

philosophy and science. Statistical mechanics in science (as opposed to direct one-to-one causality) overcomes the quirks and deficiencies in the behaviour of phenomena due to the absence of direct one-to-one causality in the nuclear and sub-atomic matter; but that does not mean the old philosophical causality can be dispense with altogether; for causality still occurs, only statistically. So, logically, statistical mechanics is also caused. It may not be as direct as throwing a rock to shatter a glass window; it is more like your rock going through intermediaries before reaching the glass window, so that crooked lawyers can disclaim liability; but in logic you're liable for indirectly causing the damage. This is a brief account of the type of causality now envisaged under statistical mechanics. The many mysterious behaviours of sub-atomic and nuclear matter are not without cause; for they occur because those particles exist; if they did not exist, the events associated with them through indirect causality (or statistical mechanics) would not occur.

There is so much in physics crying for research in dept which scientists have neglected by relying on the fictitious Minkowski formula. Still on the quantum (as energy-second, the quantum is time dependent; it materialises periodically in accordance with our time, the units of our time as explained in the section of quantified time. If this time is peculiar to the earth, as I think, then the quantum mathematics cannot be universally applicable; and so the fear that the cosmos contradicts the law of direct causality might be misplaced.[195] I couldn't put it stronger than that. It is sufficient to indicate by this idea that more research is needed, as I suspect that the energy-second which is applicable on this planet might not be universally applicable, and so we cannot rely on the nature of "our quantum" alone to argue that direct causality is cosmically abolished---it may be so from our point of view *only*, but, after all, how important are we. There are stars so immense that millions of our sun will find room in them. Then we must think of the size of our planet, too, as compared to the

[195] Einstein may turn out to be right after all about this matter.

sun---and the size of a human being in all that. I suspect that the quantum is not the end-piece of matter or energy in the universe at large, as opposed to what happens on this minuscule dot of a home for man.)

Back to Minkowski, he cannot hide behind the obvious lack of direct one-to-one causality to try and alter physical reality with his counterintuitive mathematics. Knowing time as it is, where is the imaginary time coming from, and what is it supposed to be like? In other words, what is the meaning of 'imaginary time'? Time, once you think of it, ceases to be any other thing than time in the clock, or quantified time as I have defined it.

The concept of imaginary time (if the reader is not aware) was invented by Hermann Minkowski; that is his ict mathematics purporting to equate space to time with counterintuitive mathematics; the *i* was meant to invoke imaginary time. The idea is arbitrary and therefore logically untenable. Its 'hook' which mathematicians, more theological than physicists, have swallowed 'whole' is completely unacceptable.

WARPED SPACE AND CURVED SPACE-TIME

This matter deserves a sub-section to itself because all scientists seem to have fallen hopelessly in love with it, quite wrongly, I think. Of course, we all know that the Einstein notion of gravity as caused by warped space has been proved. Then Minkowski came along to claim (merely claim) that space and time constitute one entity, and therefore when space warps, time is also warped. That idea is arbitrary and false because his ict equation upon which it is based is logically flawed. It is simply not true that time is intertwined with space and can warped so much so that you could (using the appropriate mathematics) meet your grand parents even before they were born. That is pure mythology, and comes from the Pythagorean 'Trans-migration of souls' long since discredited.

If it were true none of us who are not millionaires would still be living on this planet; for wherever our grand parents might be we would join them; anywhere is bound to be better than this world!

More seriously, you will find that I know the Minkowski mathematics pretty well to even incorporate it in my corny jokes. At this level every writer is a mathematician of sorts. I even agree that he makes relativity easy to understand from the point of view of mathematics—i.e. by dispensing with the 3+1 formula and still have time inherently in space as a separate co-ordinate. But please (always) remember that Professor Eddington stated that, although useful, we must never forget that the Minkowski theory is arbitrary. To me even that is unacceptable. It is not strong enough for me as a condemnation of the Minkowski proposal; useful or not, what is fictitious has no place in physics at all.

Let me digress with a brief mention of something that I know is worrying mathematicians. In discussing time rationally in that peculiar sense of physical reality championed by Ernst Mach (rather than as 'philosophy' or 'mathematics')[196], I have nothing against mathematics. But, in defence of Ernst Mach, let me say this: it is conceded that there are several aspects of physical reality (or science in general) better described (or written) with mathematics. Some things cannot be understood at all without mathematics. For instance, without mathematics we could not have time as we know it, because we could not state 'how much time' in numerical units; and without that the clock would not exist; civilization would be primitive. This could be a subject in Sci-fi novels---a people without clocks, and therefore condemned to live too close to nature. However,

[196] Mathematics is necessary for creating time in units (the year, for instance, as resulting from a point to a point; and there our time ends, unless we orbit the sun again); but time can never be geometrized because it is not entirely physical. The physical aspects are used merely to quantify it; but there is the inner sense of time, as the sense of duration---and how do you geometrize that? Feeling the sense of duration is as important as the hand on the clock.

mathematics should not be allowed to dominate the entire field, for the simple reason that you could not demonstrate or write what we know about physical reality by mathematics alone; even if you could do that nobody would understand you.

The suggestion I am making is already graphically illustrated by the life story of the British Nobel Prize winner, P.A.M Dirac, the man who averred that Albert Einstein was the greatest scientist of all time because, "Only scientists like Niels Bohr and Max Planck were qualified to wipe his boots. His theories came out of the blue. They did not follow from what had gone before [and, I would add, yet they work.]".[197] Dirac himself was the greatest British physicist since Isaac Newton. However, he was regarded by his peers as a poor communicator, and sometimes incomprehensible. "…as a thinker he was unintelligible except to mathematicians. Even his fellow physicists complained that he worked in a deliberately mystifying private language…" His reply was that, "The quantum world could not be expressed in words or imagined." (Taken from John Carey's review of THE STRANGEST MAN: The hidden Life of Paul Dirac, by Graham Farmelo. Published by Faber, 2008.) Here we have both sides of the argument sufficiently elucidated. The scientific genius wanted to communicate mainly by mathematics. His equally brilliant peers objected that sometimes even they could not make out his meaning. And his response was interesting. He claimed that he was not to blame because the quantum theory was necessarily abstruse---and we know he was right. Einstein being 'Einstein', the special theory of relativity was also difficult; and general relativity almost impossible to imagine. So both the genius and his critics are obviously quite right. Quantum theory is abstruse, no doubt about it. According to Niels Bohr "Whoever is not shocked by the quantum theory has not understood it." On the other hand, the genius has a duty to make himself understood, otherwise why bother to communicate at all? In parts of his

[197] I am quoting from memory.

ABC of Relativity, Bertrand Russell warns the reader not to try to visualise what he was describing in general relativity. That is one way of solving the impasse.

This means that what you state with equations (as Bertrand Russell always did) must be rendered in words too, however imperfectly. If you cannot do that your theory will never be able to stand logical scrutiny due to the absence of clarity in definitions. Here is the example I am most fond of: before Minkowski space and time were separate entities. In special relativity "they play distinctive roles", yet it works. How did they come to be one entity after Minkowski? To dwell on his so-called 'counterintuitive mathematics' raises two questions: (a) His mathematics must be faulty, for obviously special relativity works pretty well. (b) Mathematics alone cannot demonstrate the nature of physical reality; thus the Minkowski formula does not accord with the physical reality revealed by special relativity. Hence Mach was right.

Mathematicians thought the Minkowski formula was a blessing as it makes things easy for them by incorporating time into space; in fact, it has turned out to be a curse, and a very serious one, too. They are pretending under the term 'space-time' that time and space are unified in the Minkowski sense. I am ashamed of this subtle intellectual subterfuge in physics.

The 4-D geometry is the ideal solution. Or, rather I should say, it would be the ideal solution if it were true of the natural world. Since it is not true and therefore is untenable in physical reality, it belongs to the realm of fantasy---'Dream Physics', I call it. So they don't know what to do, because they have already incorporated it into physical theory; they can do that, as I have said before, because in theoretical physics no *immediate* consequences flow from theories---therefore nobody gets hurt when theories go wrong. Now mathematicians must swallow their pride and agree, as Kurt Gödel argued, that whatever we do certain aspects of

mathematics can never be completely objective.[198] This is a clever idea; and it accords with the Platonic simile of the cave. Thus, in relativity, we must revert to the 3+1 formula used by Einstein in special relativity---if it worked there, it would work anywhere else due to the 'Two postulates'. 'Anywhere else' means in any inertial frame subject to the 'Two Postulates' of Albert Einstein. For after all we need physics (or theories of physical reality) to be effective only in an inertial frame, which is the field of special relativity applications, and where we know that the 3+1 formula works absolutely perfectly.

On the other hand, the 4-D geometry is merely 'assumed' to work in general relativity without proof. I actually believe that most of the post-relativity work in general relativity and cosmology has been falsified by the reliance on the Minkowski formula---but mathematicians only have themselves to blame, because Bertrand Russell and Professor Eddington said plainly that the Minkowski theory is fictitious and arbitrary, which meant that, logically, it was only a matter of time before it would be rejected by thinkers.

Yet they did not listen. Objections were regarded as evidence of one's ignorance of counterintuitive mathematics. All the time the proper definition of time was not even attempted. For example, where will the next second come from if the earth stops orbiting the sun? From the obvious answer that it cannot happen (or at least not just yet!), because the earth is

[198] Incidentally, I wish to point out that the Gödel formula, known as the Gödel Universe or Gödel Universes, is vitiated by the Minkowski theory upon which it is based. Every supposition influenced by the Minkowski fiction is bound to be logically flawed. It seems to me a sheer waste of intellectual effort since Eddington, Russell and Professor Whitehead told us that the Minkowski formula is logically untenable. Perhaps scholars have been encouraged to rely on Minkowski because it makes things easy for them, and also because even Einstein accepted it. Let me say that Einstein was coerced. Secondly, he knew that it could not affect relativity because whether time is the same as space or not the second is always the same; and what he wanted *is* that time is incorporated in the study of phenomena as a distinct co-ordinate.

gravitationally programmed to always go round the sun, we get the evidence that (a) the time units we use to tell 'how much time' without which our civilization could not survive, are derived from the repetitive motions of the earth; and, as such, are clearly human in origin. That is one proof that we use external cycles in union with the sense of duration to quantify time for cultural use. (b) It also goes to show that the continuity of time is obtained from the succession of time units---the repetition of the year, for instance.

The year is what we sub-divide to get all other units of time on earth. Thus no matter what mathematics are used, it is not possible to equate time (derived from space) to space again! That is a contradiction in terms. The whole of post-relativity physics, the real nature of physical reality, and even relativity itself are all distorted by this mistake by mathematicians.

So I rather accept the contrary position taken by the Mathematical Society of Japan, from whose Encyclopaedic Dictionary of Mathematics[199] I just have to quote the following consensus again for emphasis because Time Dilation is very controversial as it is assumed that it means Time Travel is scientifically possible.

The truth is this: "Historically, the transformation formula [the equation is stated, but unnecessary here][200] was first obtained by H.A. Lorentz, under the assumption of contraction of a rod in the direction of its movement in order to overcome the difficulties of the ether hypothesis, but his theoretical grounds were not satisfactory. On the other hand, Einstein started with the following two postulates: (i) **Special principle of relativity:** A physical law should be expressed in the same

[199] Published by the Mathematical Society of Japan, The MIT Press, Cambridge, Massachusetts and London, England. Ed. Kiyosi Ito. Vol. II, p. 359 B.

[200] The Lorentz Transformation and The General Transformation of Co-ordinates are discussed by Professor Eddington in *The mathematical Theory of Relativity*-- Sections 5 & 15. In any case, the Japanese mathematicians did not think much of the Lorentz Transformation, neither did I, and it is not strictly relevant here either.

form in all **inertial systems** namely, in all coordinate systems that move relative to each other with uniform velocity. (ii) **Principle of invariance of the speed of light**: The speed of light in a vacuum is the same in all inertial systems and in all directions, irrespective of the motion of the light source. From these assumptions Einstein derived [the Lorentz Transformation] as the transformation formula between inertial systems **x** = (ct, x, y, z) and $x^1 = (ct^1, x^1, y^1, z^1)$ that move relative to each other with uniform velocity v along the common x-axis. This was the first step in special relativity, and along this line of thought, Einstein solved successively the problems of the Lorentz-Fitzgerald contraction, the dilation of time as a measure of moving clocks, the aberration of light, the Doppler Effect, and Fresnel's dragging coefficient."

The time Einstein used, according to him, was the Lorentz local time, provided, it can be defined as 'time, pure and simple'---meaning it is all there is of time; this qualification is very important. (Apparently it can be so defined, for it did not hinder his work until Minkowski intervened.) It means every time is somebody's local time. To overcome that we have learnt to mechanise our time in the clock for general use---but, and this is the crucial point, it is based on the earth's motions. So earth time as derived from the earth's regular motions is all the time we have or can have.

Yet, by using concepts like the 'homogeneous Lorentz group', 'time reversal' 'space reflection', 'parity transformation', 'the proper Lorentz group', and so forth, none of which made the original Lorentz formula satisfactory, as the Japanese mathematicians aver, cosmologists, the interpreters of general relativity and pure mathematicians are propounding impossible theories about time and calling them Einstenian, but mostly inspired by the Minkowski theory that Russell and Eddington have clearly described as arbitrary. I hope I make myself clear to avoid any misunderstanding.

By the Minkowski theory time travel is said to be 'a scientific possibility'. I am afraid that is not true. All notions of time travel are sheer humbug, because Minkowski was wrong. I

have to add that it is quite unacceptable to try to conceal logical errors in thought with mathematics as Minkowski has done. Einstein is not to blame; he was literally coerced by mathematicians to accept the Minkowski formula, but either way relativity is not affected.

There is credible evidence to justify the claim that relativity is not affected whether time is regarded as the same as space, or independent of space. Even I should say that the evidence is not only credible but strictly logical. In the special theory of relativity Einstein made time independent of space. Why didn't he go back to make the time the same things as space in the 4-D geometry after he adopted the Minkowski formula? To me, it is because good old Einstein was no fool. He despised the 'superfluous learnedness' of the mathematicians who were tampering with his theory; yet he needed the support of the scientific public, the majority of whom were coercing him to adopt the Minkowski theory. At first relativity was universally ignored; so he acquiesced; but he was no fool. I believe he knew that either way relativity is not affected. Thus he left special relativity as he originally conceived it---where space is separate from time.

But whether time is the same as space or separate from space, the second is always the same---time is always the same; and Einstein wouldn't miss that point even without his brains. The difference between the two versions of time is philosophical, and it is this: thanks to Einstein we now know that every time is somebody's time; that there is not one (overriding) system of time that covers the whole universe. A second here is not like any other second anywhere else. The Lorentz concept of local time was called 'time, pure and simple' by Einstein, meaning that it is all the time there is, or can be.

Considering how fundamental time is in human affairs, this is a philosophical concept of a revolutionary kind---there are as many times as there are bodies. Russell put it most succinctly (and I quote him again): "…there is no longer a universal time which can be applied to any part of the cosmos without ambiguity…" It means our time cannot be applied anywhere

else. He's right. So far we know only of the time we have created as our local time to suit the earth's motions. Yet time goes to the roots of our existence. It is closely associated with 'Being' or 'Existence'. There is a natural aspect of time in our conceptions. Professor Eddington called it 'the internal time-sense', being the sense of duration. But we also know that it requires points; therefore it cannot be the same as 'Being'. It could not have been invented without using points; sentience was required.

Thus we must look for an aspect of life that can be mathematically linked to repetitive external cycles (the years, for example) to yield units of time that accords with physical reality (the most obvious is Day and Night), and can also be mechanised in a clock, which, once achieved, should be seen as man's greatest intellectual (scientific, mathematical and philosophical) creation or invention---and Einstein led the way to the most logical theory ever; that is the reason I maintain that time was Einstein's greatest achievement, for that is how we can logically link physics to philosophy by means of time.

Hence in post relativity physics time must be based on our roots, and I think it is now seen as such. But how? The mechanics must be explained. Well, time is now logically conceived as something whose roots in our minds are based on the sense of duration (or the capacity to experience duration as an internal sense of time, as Professor Eddington put it: that is, of the impressions, images, and so forth, of things *enduring*, since it takes time to endure or linger), and therefore part of the *physical or physiological mechanism for memory*---if memory is defined as 'the capacity to repeat'.[201] And that is how we link physics to philosophy through the physical nature of time.

[201] This goes to the roots of our existence because it is part of the mechanism by which we gain knowledge and remember it---which is the sum of the contents of the human mind; part of that knowledge by which we live is the concept of time, of things lingering. It takes time to linger; added to repetitive external cycles, we get time units to mechanise into clocks.

I confess it is (or I should say 'it was') technically difficult but I have somehow managed to show why the Minkowski formula *seems* to work. This is just an elaboration of the gist of the above paragraph. But for your (and everybody's) benefit it will do no harm to repeat it. The question is whether time is secular and originates on this planet, or it is generally in the universe to be invoked with the appropriate mathematics (and mathematicians seem to prefer the cosmic interpretation that implies the existence of God); secondly, whether *i* can invoke such a time. It cannot because imaginary time does not exist anywhere except in a dream. However, time (or the second) is always the same in our minds whether the time is seen as separate from space or part of 4-D geometry; and that is what Minkowski exploited. The second is always the same in the mind, but how does it get there? Again, I have shown the technical methods in my works as a link between the sense of duration and external cycles---the years, for example---*and Professor Eddington said much the same thing (Ibid, Ch. 1.8.)* Professor Eddington wrote: "The rough measure of *duration* made by the internal time-sense are of little use for *scientific purposes*, and physics is accustomed to base time-reckoning on more precise *external mechanisms*." (Ibid, Ch. 1.8---p23, my italics.)

Here is a brief explanation of the idea that Duration x external cycles = time in units, for usable time is in units only, known as 'quantified time': the year is just one unit of time, and all other known units of time are derived from the year with points, thus making them also discrete, including the cesium units.

To begin with, let us assume there are no clocks: now suppose you see an image on TV, then it goes away after a while. How long it was there is its "duration" in sense or the mind, otherwise known as 'the internal sense of time', or 'the internal time-sense', as Professor Eddington put it. It must be clearly understood that duration implies the passage of time---i.e. during the period (or the life) of an event. But obviously it is not enough; it is not the time you can mechanised in a clock

for general application. For cultural purposes[202], something else must be added to the duration, namely, it must be converted to units of time. This is easy to do, for we know how we get the earth-year as a unit of time---round the sun as a cycle. In fact, the year is our basic unit of time, metaphysically. To have more units (or years) we go round the sun again, otherwise there are no naturally occurring time units, or years. The process of creating time units to mechanise into clocks is the metaphysical origin of time as a union between duration and how it is broken down into units---or cycles.

Thus, to convert duration to time units, you will have to use repetitive external cycles like the earth-year.[203] This procedure will be the same for any sentient beings anywhere else in the universe; we can only use repetitive cycles to create time in units. That is the only logical way to obtain time in quantified units---otherwise time is 'silent ageing', 'silent motion', or 'the silent passage of existence', *all of which are useless to science and logical thought*. Without mathematics logical thought (in abstraction or in any depth) is not feasible[204]; and you need to apply mathematics to duration to get time in numerical units suitable for logical thought. In sleep or coma time will be passing by. But when you come to and want to know the time or how long you've been senseless, you will need mathematics based on some kind of repetitive motions or cycles to be able to have the time in numerical units.

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[202] For any purpose where time is to be cited (as the additional co-ordinate of relativity, for instance), you need to have the time in numerical units, which can only be achieved with external cycles.

[203] This is easy to understand. You can even tap your finger, and say, for instance, the duration (or the life of the relevant event) was for so many taps of the finger.

[204] We hear of the invention of points being necessary for mathematics. In fact, basically, it was a logical invention necessary for mathematics, since mathematics is logical thought in abstraction---e.g. for handling massive volumes and representational reasoning where you cannot see what you are talking about.

We on earth use the earth-year as sub-divided down to the seconds, or the cesium units, to determine the time "during which" the image on the TV was there. The term 'during which' means duration, but it is not enough as time.[205] You will have to relate it to some of the sub-units of the earth-year to get the appropriate time. (*You will say the event was 'so-and-so long'; that so-and-so period is obtained elsewhere and applied to the event. Metaphysically there is no other way.*[206])

Thus we apply some of the earth's sub-cycles to 'duration' to get the time for anything, any experience whatsoever---to get the time 'during which' 'it' was there; and that means converting duration to time by linking it to external cycles. The external cycles themselves do not constitute time, either. They are given durations, or periods of mental lengths (during which they were there), before they can constitute time: a month is longer than a week; and so forth. A second is shorter than an hour. *It is by the sense of duration (during the life of an event, an image or an impression) that you can determine which unit of the external cycle to apply to it to get the time, or the number of cycles it was there*. The two statements (time and number of cycles) are exactly equivalent.[207] So that you can say it was there for one cycle = one year. Or apply any of the sub-units of the year's cycle to it. Due to our use of clocks we have forgotten that this is how we created and mechanised time for the clock/Calendar system. The clock is linked to the Calendar system

The metaphysical question is whether there is any other time. Well, the passage of existence is regarded as time, but it's not quantified or usable time. My own opinion is that the method described is the only logical system that any sentient beings in

[205] Because images, impressions, events and so forth, can linger in the mind, they are obviously connected to the mechanism for memory, which is defined in science as "the capacity to repeat".

[206] That is why 'time' and 'the application of time' are two distinct operations of the mind, but often they are conflated leading to unnecessary mysteries about time, as discussed earlier.

[207] For example, the numbers of the earth's cycles or orbits round the sun are known as years, and they are periods of time.

the universe will use to get their quantified time because logical thought must *definitely* be universally the same everywhere as we have it on earth---for it is a process of reasoning about percepts, or things. Existence refers to things of all kinds. Nobody can live rationally in any part of the universe unless he or she adopts a reasoning process according to percepts, and that is what we call logical thought. It may get more complex and mathematical with increasing volumes (and in non-demonstrative inferences), but ultimately it must be based on percepts. Even Idealism, before it was successfully refuted, was somehow related to percepts: if you cannot see anything the question as to whether it is mental or physical will not arise---simply because the 'it' will not be known. If the Irish philosopher, Bishop Berkeley, ever saw anything (say, the pen he wrote with, the paper he wrote on, the table and chair in his study), then there is no argument. In any case, Berkeley rather confirmed the existence of the quanta hundreds of years ahead, without knowing it, as Bertrand Russell has pointed out in his *History of Western Philosophy*. The most interesting refutation of Idealism, of course, is the quip that a train at a station that can be seen to have wheels cannot be said to lose its wheels when in motion just because the passengers are not *seeing* them, or looking at them as the Idealist ideology requires.

About myself and reactions to your criticisms, I confess I felt a little sad, not really annoyed but rather sad, that you should mention the Minkowski mathematics to me. At this level it is most unfair to assume that I could be ignorant of the Minkowski mathematics. The truth is that mathematicians have overlooked the caveat of Professor Eddington (in his monumental opus, *The Mathematical Theory of Relativity),* to insist that Minkowski has changed the nature of time with his formula. To repeat: he said plainly that the Minkowski formula would be ideal for describing phenomena, but, while mathematicians may consider it as useful, they must not forget that it is arbitrary and fictitious (*Mathematical Theory of Relativity*, Ch.1.1.)

Yet what is the situation now? We find that *what* Professor Eddington and Bertrand Russell have both described as arbitrary is giving cosmologists and mathematicians tarnished reputations because they allow their works to be guided by it, and out of which such mythologies as time travel become scientifically possible. As always with poor old mankind, people show how clever they are as books about such subjects sell millions and my books are ignored! Even the journals will not publish my papers, and judging from what you say, and seem to believe in so completely, I am not surprised. If Minkowski was right why didn't Einstein go back to amend special relativity?[208] He was coerced to use the 4-D geometry in general relativity to make it easier to understand---but he was wrong.[209] As a result of which general relativity is now in a hopeless mess. Yet again, either way the basic postulate of general relativity (the curvature of space for gravity all the way to inferences about black holes) is not affected. Einstein was no fool! Footnotes of his theories will come to replace the footnotes of Plato's theories in philosophy. That is my prophecy. Einstein must have known that, intellectually, he's something like God.

Finally, I have already indicated that we can link physics to philosophy through the relativity concept of time; we can do

[208] Another question is when cosmologists and mathematicians are going to realise that earth time is not applicable to any other world, frame or metric outside this planet. All the work they have been doing in general relativity since Einstein is vitiated because the Minkowski 4-D geometry is not true of the physical world---neither here or anywhere else, because his mathematics linking space to time is logically untenable.

[209] What all those lazy (and also probably religious) scientists want is that time does not have to be added to phenomena in the 3+1 formula as Einstein proposed; they rather prefer time as inherently part of space naturally. But that is based on the Minkowski formula, and the Minkowski formula is logically invalid. It seems we are speaking about two different worlds: one which obeys the laws of logic, and another that lives in the imagination of some scientists because of the Minkowski false theory. Yet since the deaths of Einstein, Eddington and Bertrand Russell, they have incorporated the latter into theoretical physics---it is wrong, but who is to check them?

the same thing, again, through the same Einstein's concept of the quantum, or his "Light Quanta" theory, too. Originally he called it 'a hypothesis'. But it is no longer a hypothesis, not even a theory, as scientists have confirmed it as a fact of nature through QED. So the man I call the only God we know did a lot to justify his divine appellation a hundred times over.

The quantum is seen as light. A single one will be a solitary speck of light of a specific hue; and as small as they are, scientists have invented a machine for counting them one by one (QED is said to be the most well-established of scientific theories, and is all concerned with quantum interactions). *En masse* we call them quanta---or the smallest pieces of matter that can exist.

We can link physics to philosophy through the quantum because it is light, and we have always thought we see only by means of light. That idea is rather a misconception. In actual fact, we never see things at all; we see only their images.[210] Physiologically it is quite impossible to perceive anything. Seeing occurs in the brain not on the eye. How, for instance, can we fit a house physically into the brain's tissues? Rather we think we see a thing because its lights consisting of these very small quanta reach the eye with its exact image, and thence to the visual cortex in the brain. So we see only the surface lights of things, not the things themselves. Another philosopher conceived his theory of vision just to account for this very fact. It is precisely what the Irish philosopher, Bishop George Berkeley, stated in his philosophy, although he interpreted it wrongly, as Bertrand Russell put it: "Berkeley advances valid arguments in favour of a certain important conclusion, though not quite in favour of the conclusion that he thinks he is proving. He thinks he is proving that all reality is mental; what he is proving is that we perceive qualities, not things, and that qualities are relative to the percipient." *This is a permanent proof that we do not see things; we see only their surface qualities in the form of their exact images as*

[210] Plato conceived his Theory of Ideas to account for this fact.

constituted by their light emissions, or radiations, by means of quanta---the smallest bits of matter in existence.

We interpret this as meaning that we see only the smallest parts of matter that, by their nature, can never stand still and always radiating about through their interactions with the electrons of matter. So we see matter, and yet do not see matter. We see only matter's smallest parts flying about---but they are also matter.[211] The philosophical importance of this is that pieces of matter do actually fly off things with their exact images; when we capture some of these tiny pieces of energy, or quanta, on the eye we see the things (that 'shimmered them forth', as Sir Oliver Lodge put the idea.), and with all their colours because the quanta are naturally coloured. There are intricate technicalities in all this; physicists will not put it so bluntly or crudely; they will have to add a number of fine qualifications. But to philosophers, that is enough to work with. Capturing quanta from things to see them means, as Bishop Berkeley supposed, seeing the surface qualities of things and not the things themselves---the main reason is that all seeing is 'Tele-Vision'. When you are very close to a thing it is difficult to see it properly; if it is too close to the eye you might not be able to see it at all without confusing blurs. Seeing by means of quanta is precisely like photography. The only problem is size.

Size presents a special problem that can only be settled with a dose of speculation as opposed to solid facts. But the speculation is based on the facts given above, and they have been proved more than sufficiently. All that is required is that the inferences based on them should be logically valid.

[211] Because of QED we cannot (at least I cannot) escape the fact that the quanta are the smallest pieces of matter out of which all other forms of matter have emerged through coalescence. The Scientific Industrial Complex has found another way of spending our taxes, so scientists can go on (who can stop them?) building larger and larger 'Atom Colliders' to split atoms in search of the basic building blocks of matter; but for me, my notions of the origin of all forms of matter begin and end with the quanta.

Now, because it involves the quanta, seeing is obviously like the electronic scanning of (or in) computers.[212] We imagine that human vision occurs atom by atom, since the quanta are the smallest sub-atomic particles---they interact with matter through their sub-atomic parts, particularly through the electrons of atoms of matter. This well-known electronic process gives a clue as to how size is handled by the brain.

The thousands of pages in a computer file are not spread physically in the computer as we spread papers on a table. Similarly, even a single A-4 paper cannot fit into the brain's 'bloody' tissues. When surgeons cut open the brain they see only bloody tissues; yet these same bloody tissues give us awareness of non-bloody percepts; and we know that is possible only at the sub-atomic level of physical reality. At this point a certain amount of speculation creeps into our thoughts. We believe that seeing the paper (of any colour) involves electronic processing of quanta in the brain, where the bloody tissues our surgeons see are not bloody at all but part of the electronic processing of quanta in things and people's heads. The paper's size is electronically scanned end to end. Since it has its own colour, when it ends, its colour will also disappear, signifying that the thing is no longer there---and another thing's colour will take over. Let us suppose that the paper is white. At every end of it (all four corners of it) different things' colours will take over. We call the four white corners 'the paper'. The other colours would belong to something else, because the paper has ended, and something else must be there not void. Even void has its own colour to identify its presence. This is how one thing is one thing, and another thing is also another thing in vision. Needless to say, given the nature of human motives, confusion in vision can be

[212] I have to sound the warning that, although the computer can give relevant examples regarding the operations of the human brain, all such examples are copied from the brain. Let me explain this contradiction in terms. Scientists take suppositions from many sources and test them; some work, others don't; but even those that work are poor imitations of how the brain actually works---certainly less much complicated than the real thing in the brain.

induced through this method of visual perception---in magic, for instance. The white sheet of paper will no doubt stand out; but when it ends, its colour will also end to show that it is no longer there before the eyes. The end of an image is marked by change in colour. As far as the brain is concern, the process of seeing the white piece of paper is like the computer scanning it minutely atom by atom at the quantum level, which is very small indeed.

In this way objects of any size can be visually perceived (or electronically scanned visually), without having the things (of so many different sizes) physically lodged in the brain tissues. Thus it is conjectured that size in vision is determined by volume, shape or form, colour, space and position---all of which can be interpreted as 'different colour patterns'.[213] *The light we have to shine on things to see them create billions of quantum points of emission, "scanning"*[214] *the objects of vision as if with a torch in the dark, but from billions of points, thus conveying size in vision. So light does not illuminate objects for us to see them; rather they cause objects to emit lights that carry their own exact images---thus making the Platonic Theory of Idea redundant, as a bonus.* Let me repeat

[213] There is scientific support for this because the best scientific definition of size in vision is called "pattern recognition"---sometimes the phrase is used to represent the actual process of vision itself.

[214] Scanning is not the correct word; but there is no correct word. What is involved is so unique there are no similarities. You have to pity those who write about the quantum with our "crude" traditional means of communication. The nearest description is to say the individual quanta are so small that the total number required in coded format to give vision of the wide open sky would fit on to the sharp point of a needle with copious room to spare. And they will persist, making it look like scanning. So long as the thing is there, the quanta radiating from it will persist; therefore vision will occur---the eye is bombarded by the quanta from the thing. Remember that they are trillions x trillions x trillions; they are persisting; they are radiating from all aspects of the thing; thus they will continue to give vision of the thing. The visual process is better described as the absorption of quanta, the quanta from things---we do not see the images of objects such as is supposed on the old Platonic theory. We absorb their material signals direct from them; if they are big, the visual process is like scanning their surfaces---not quite, but almost like that.

this because the Platonists are pretty stubborn: the light source does not illuminate the objects we see. We need the light all right, but it does not illuminate objects. By the miracle of quantum computation and interactions, this is not at all surprising. In fact there is no such thing as illumination in the universe. As we have seen, Niels Bohr defined light as the "Transmission of energy between material bodies at a distance". Thus we should regard the quanta from the light source as interacting with the atoms of the things we see, rather than illuminating them. Emission and absorption of radiation is corpuscular. In the absence of illumination in the universe, Plato was plainly wrong.

The inevitable conclusion is that both science and philosophy (or physics and philosophy) have identified one entity as the ultimate cause of the nature of physical reality, or "What Is", namely: we see the world through the quanta; also in all its physical analysis of the nature of the external world, physics has identified the quanta through QED as the cause of all physical reality in its multitudinous forms. So physics and philosophy are linked in the existence of the quanta, another of Einstein's discoveries. He has therefore done more than we expected of God---even Plato's theory of Ideas is no longer interesting.

On the other hand, if we are to replace the Platonic Theory of Ideas with the new concept of "Quantum Signals" issuing from things to enable us to perceive them visually, then we have to adopt the corollary, which is "Coded Signals In Perception", meaning that things are given codes in the brain for purposes of memory (and all cognitive processes) and not the things themselves physically, since all things are just too large to fit into the brain as they are seen externally.

This may sounds confusing, so I will do my best to explain it. I think electronically coded signals cause vision, and that it is the reason we can dream of objects and of events with the eyes closed. REM seem to indicate selectivity and scanning as in the computer. It is interesting that scientists have found that

vivid dreams are particularly associated with REM.[215] The electronic coding may have internal and external aspects. Internally, it is obviously part of the mechanism for memory. Externally, the brain must have created categories of 'perceptive images' (images of classes and groups of objects) over several centuries: the figure of a person, the flight of birds, quadruped motions of animals, shapes and forms of objects, and so forth---a long list of categories, literally infinite. Anything new will get its own category; anything known will have its established category already in place; thereafter associated objects will be added to it. What is on two feet, would be assigned to the category of two-footed creatures, including people; what is flying, to the category of flying objects, and so forth.

Thus we imagine that when something is apprehended, the brain is able instantly to place it in its appropriate category and recognise it. Internally, the codes of things come into play when the thing is invoked (through the appropriate stimuli); so that however big, it can be seen in the mind's eye, because the coding system is electronic at the quantum level. These are all guesses or speculation, but without them vivid dreams cannot be explained. We are trying to imagine how the brain works; nobody has any cast-iron proof.[216] But what we have found so far sounds credible. The computer can help, since it works through the system known as 'pattern recognition'; and, as I have said above, in the matter of deciding how size appears in vision, we assume that the quantum signals from things behave as if they are scanning the objects from end to end. So

[215] By the Sleep Research Centre at Loughborough University, for instance.

[216] However, as his final theory of the human mind, Bertrand Russell said that when a physiologist is examining the brains of a patient, what the physiologist is seeing is in his own brain---see the Chapter, My Present View of the World, in his book, *My Philosophical Development*. This theory of the mind implies a perceptive process that relies on signal codes in visual perception: the patient's brain parts invoke the appropriate codes in the physiologist's brain to make him see them---as he would do in dreams with his eyes closed.

the size of any object will extend to the end of the thing's colour. In this way it is believed that size is determined by shape or form, position and colour---all of which can be abstracted to 'different colour patterns', because even 'the void' has to have its own colour---its colour has to be different from those around it.

There are aspects of the brain physiologically established from scientific medicine, computers, and human behaviours that suggest that the above theory may be close to the truth of how the brain actually works. Nevertheless, even if the suggestion is proved scientifically, it will take centuries for people to digest these very difficult ideas based on relativity and other ideas of Einstein which are also not yet properly understood even by some eminent Professors.

One of the difficulties comes from the fact that, if the quantum is a product of our time, as erg-sec, and the units of our time that give rise to the quantum, are also products of the human mind (through a link between the sense of duration and external cycles), then the nature of human life ought to be re-defined because it is not properly conceived either in science or philosophy. For the quantum, which is the basis of all matter as far as man is concerned, may not be naturally in existence throughout the universe in the form it appears to us, but rather materialises through our *unique* way of moulding elements of nature to suit our nature.

From this point of view, the 'Copenhagen Interpretation' can be adapted to mean that the strange behaviours of sub-atomic matter may be due to the strange manner in which the human mind is 'generated continually' and interacts (and interferes) with nature, namely, not constituted as a solid matter (or mass) but put together by fleeting and highly perishable impressions at the electronic level---and always growing, changing, interacting and inter-communicating through the neurons.

It seems nature does not see us as special, or as human beings with powers of our own, but mere neurological robots with no right to claims of superiority or any metaphysical pretensions

over any other thing in existence. Perhaps we are more efficient than other animals in nature---well, maybe that implies that we are somewhat superior in a way, but I doubt that that is metaphysically significant. Nobody can have the last word because nobody knows what the origin and purpose of life is.

The importance of what Einstein did, even without knowing it himself, is this: since the dawn of civilization philosophers have been trying to interpret the world to know what it is made of, or how it is constituted. Out of their inquiries scientists arose to claim that the philosophers have got it all wrong. And they started their own lines of enquiry, the chief part of which is the physical analysis of the external world, known for short as 'physics'.

Einstein did not know that the philosophers and scientists have reached a stage in their enquiries where all their theories coincide in the discovery of the quantum---as the most credible candidate of What Is. And the miracle is that man does not even have to infer this idea from any complex theoretical postulates from scientists or philosophers. We see the quantum plainly as light. Of course, it has taken a long time to come to this conclusion, more than one hundred years in fact. Einstein himself did not know it---unaware of the significance of what he had achieved. That is because the work of interpreting his ideas to enable us to come to this conclusion was difficult.

The most important thing was the new secular theory of time. Until then time was so mysterious that it had literally become the last hiding place of God after Charles Darwin. I can imagine religious leaders smiling smugly since Einstein at the increasingly bizarre theories coming out of physics, due to the mysterious nature of time as they still saw it.

But now that time can be seen as something that originated from this planet (because there is no such thing as 'universal time'), and can be seen as a union between the sense of duration and external cycles, time is liberated from the

religions; although it remains the most important aspect of life, second only to how the life itself came to be in the universe of inanimate matter, and without which no civilization (to sustain life) could have been possible. With this secular theory of time, added to the theory of quantum, we can now agree that man's science will die with him when the earth ceases to be habitable. Nature is far from uniform; the theories that work for us here on earth will die with us; so let's make the most of our good fortune in the work of Albert Einstein.

With the above thoughts in mind, let me hurry to point out that the importance of linking physics to philosophy is to defeat the murderous peddlers of stupid religious myths from all the religions. Since philosophers are strictly logical thinkers, it will put an end to all that buffoonery nonsense from callous religious bigots. Once we eliminate such murderers, the only remaining problem, as I see it, is how best to control science rationally to man's utmost benefit all over the planet, so that a scientific forum, organised on the lines of the UN, will come to exist---hopefully---to eliminate mad scientists, who will come, oh yes, they will rise, probably disguised as scientific prophets.

We already have the World Economic Forum in Davos; that is a good beginning. But as a mere 'Talking Shop' it has no teeth. The proposed 'Scientific Forum' should be spared a similar fate. One requirement is that the eminent scientists who will attend the 'Scientific Davos' should all be heavily bearded like Darwin---even a false beard will do! People are always afraid of bearded gurus, for well shaven ones resemble Playboys. A guru is supposed to be too busy thinking to remember to shave.

Luckily, all nations need science and technology. How about using science to incapacitate rogue nations' computers as sanctions to punish misconduct? The wars of the future could well be electronic to spare mankind bloodshed. Rogue states could easily be paralysed: computers, telecom systems, power generation and water supplies can be electronically damaged

to make rogue state pull back from the brink. I believe power outage alone can bring such states to their knees. And there is no longer 'A Soviet Union villain' to go and take advantage against the West in rogue nations! The greatest political achievement in the history of the world was the abolition of the *Communist* Soviet Union. We must resolve never again to permit (even merely contemplate) considerations of national sovereignty to obstruct sensible collective actions worldwide for the safety and prosperity of all mankind. While we search for the metaphysical purpose of life, 'Love Thy Neighbour as Thyself' remains the best philosophy on earth, for after all we all want to live in peace, harmony and prosperity. No moral value transcends love, harmony, peace and prosperity. This is my 'Testament', and in my opinion, the best piteous plea to the warlords with which to end this book about time for the whole planet---as a purely secular thing.

NOTES & REFERENCES

Aspects of this book have been published before at my own expense, and therefore necessarily in small volumes, but this is the complete version. As I originally came from the deep jungles of British Colonial Africa, and have never had a full formal education even at the primary school level, while teaching myself mathematics as I trudged along wearily, I found this work about time onerous and complex, and came to the conclusion that time must be the most difficult subject in life overall—that is, after you have the life! Otherwise, of course, the study of life itself is at the apex of all human concerns. For this reason, and with the needs of the reader in mind, I have given easy access to references in the long footnotes to facilitate the reader's immediate, on-the-spot understanding. However, certain landmark books and articles need to be mentioned in all works of this nature, and a few of the most important known to me are listed below.

ALBERT EINSTEIN (1879-1955)---SPACE TIME, an article in the 1926/27 (13th) edition of the Encyclopaedia Britannica. Also, RELATIVITY, in the same edition.

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CHARLES A. FRITZ: Bertrand Russell's Construction of the External World, Routledge & Kegan Paul, London, 1952.

Professor JEREMY BERNSTEIN: *Albert Einstein and the Frontiers of Physics*, Oxford, 1996.

Professor RICHARD FEYNMAN: Lectures---*The Character of Physical law*. MIT Press, 1967. There are several volumes of the Feynman lectures and they are all worthy of serious study.

Abraham Pais, "Subtle is The Lord: The Life and Science of Albert Einstein", Oxford, 1982. Professor Pais has methodically provided details of almost all the original papers relevant to relativity. His list is so exhaustive I don't know of a better one anywhere.

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