Time

Once upon a Time
there was a man who knew very little;
he led a life most ordinary,
but always he wanted to know more - about the undiscovered and the unknown.
He was possessed of a touching naiveté
which left him in constant wonder about the universe,
and about the discoveries of science
- which were becoming more and deeper throughout his life.
The information age into which we have matured
gives us ever more knowledge -
at our fingertips literally -
and the giants of the sciences delve further each year -
each hour -
and we receive the fallout and dust of their work,
as they probe both the cosmos and the atom with their educated curiosity.

I am a layman. To prepare for this evening, I have researched; I have stood on the shoulders of the giants; I've looked at what they're looking at, seen what they've seen - and tried to understand bits of it! I try very hard; I am a keen and experienced layman - I am an executive layman. I follow Professor Lawrence Krauss when he says: "the Ethos Of Science is:- open questioning; no authorities; honesty; transparency; reliance on evidence; the understanding of uncertainty; peer review and testability – science can make the world a better place by burying myth, superstition, dogma and fanatical certainty."

I repeat "there are no authorities" in science - each man's hypothesis - though it be tested over Time and elevated to the near-but-not-quite-ever certainty of a theory, still only stands until the next man's theory alters or overwhelms it. I have studied the lives and the words of the giants like Albert Einstein, Wheeler, Faraday, Hoyle, Hubble, Kepler, Krauss, Max Planck, Newton, Penrose, Rutherford, Douglas Adams! I've watched many documentaries from the BBC; debates and lectures on You Tube - and I have read - though many have purchased it and not - "A Brief History of Time" by Stephen Hawking.

http://www.amazon.co.uk/372/dp/0857501003

Here is a brief history of my own Time:

I was born in January 1946 - in the middle of the post-war baby-boom. When my father came back from the war, the second thing he asked for was steak and kidney pie! I toddled through my first year, and I entered the cold long winter of '46/'47. In the March of that year I nearly died in a fire. If I had, then this evening would have been different for all of you. The atoms and stars, particles and galaxies of the universe rolled on in Time and space - and at 24 I ran away from home! Headed for London, as dreamers often do! I slept on a few friends' couches for a while, then took a flat in Putney with four others, one of whom, previously unknown to me, worked at a certain place in Victoria.

I applied for a job there - and met a girl. We were married, and couldn't find a decent place to live in London. One evening, 1972, I was waiting in my car and I picked up a two-day-old Evening News from the back seat. It fell open at a full-page ad with the headline "Maybe You Won't Have To Emigrate After All." It was an advert for the New City of Milton Keynes. We came up here to live, and a few years later 1979, I got a job which involved cold-calling in the training. I knocked on the door of number 63 Sheffield Road (I've changed that address for security reasons) - and who should open it but John Foggitt! That's how we met. We got to know each other; had many discussions and arguments - more than one of which was about the nature of Time!

In the fantastically, almost infinitely complex, passing of electrical pulses through the brains of me and people I've known; of you and people you've known; in the ongoing, accelerating progress of matter and energy in space and Time (I might walk out through a street door and look left to see someone who would have changed my life, but I turned right and never met them) we are all here where we are by remarkably long chain of perfectly unremarkable tiny coincidences, thinking about our place in the natural world. I met John, John met Demitri; they both met Marius - and here we are! In a science club pondering the meaning of things. We have evolved a brain good enough to examine our existence, but maybe not yet good enough to solve the final question.

Here is a picture of a number. For those of you not close enough to count the noughts, I can tell you that this number is 10 to the power of 801. This number is the number of different paths through a single, average human brain. No wonder we're such random beings - I have heard a very articulate neuroscientist called Sam Harris, claim that all thoughts are random - he argues it to the extent of saying that we have no free will. He gives anecdotes and analogies, and is pretty convincing. But look at how many different routes our thoughts can take! Mind-blowing!

I'll put a link to Sam Harris...

https://www.youtube.com/watch?v=pCofmZlC72g

I was going to joke, at this point, tell you something I heard that Einstein had said: "the only reason for time is so that everything doesn't happen at once" - but Marius pre-empted that in his email - and showed me to be wrong by saying it was John Archibald Wheeler, who worked with Einstein. I looked it up and found that although John Archibald Wheeler had said it - he attributed it to "graffiti in the men's room of the Pecan Street Café." It reminds me that Paul Simon said, "the words of the prophet are written on the subway walls" - I think that it is on such places, we might, one day, find written the theory of everything! I will quote Wheeler later.

My preoccupation with Time was indeed fuelled by a conversation with John. I had decided, in the private unordered cupboards of my own mind, that there was no such thing as Time. Mainly because I couldn't pin it down! It wasn't anything I could define! I mean - I teach English - was this thing a concrete or an abstract noun? Is that gauge a false dichotomy? Is there another type of noun it could be? I could only see that Time was a convenience used to make events fall into sequence in our human minds. It could only be represented by movement - of cogs in a clock, or the rotation or orbit of the earth.

So I said to John - right out, without hesitation, repetition or deviation, “there is no such thing as Time!” - and he said of course there is - and he drew on more than one kind of evidence to prove his point - but unfortunately all that evidence - though more complex and scientific, as you would expect from John - was only what I had already figured - he claimed that you could definitely see Time operating though frequencies of electro-magnetic waves which need Time-separation of each peak and trough to actually exist. Everything existed within a Time-frame! I kind of agreed with what he said, but it was only the same as the cogs of the clock to me - things moved, and at Time One they were in a different place from Time Two. Time still didn’t exist on its own, only through the grace of objects in motion.

After the discussion I went away and wrote a song:-

> What is this thing called Time?
> What does it mean to me?
> There’s no such thing as Time because -
> There’s only space as far as I can see!

That’s the chorus - and the entire thing is available on YTube. I’ll quote the verses later, and put a link in here.

https://www.youtube.com/watch?v=c17oBlNm8Ec

I thought that “There’s only space as far as I can see” was kind of a meaningful line - because it’s metaphorical in one sense, but a literal explanation of an experience in the other.

I looked up “Time” and found that “Time is a dimension”, I then didn’t know whether dimension was a concrete or abstract noun!

I remember reading HG Wells “The Time Machine” when I was young and the Time Traveller explained his theory in the following way. I’m kind of paraphrasing this. Let’s say I have a cube to show you - here it is - use your imagination - now I show you one face of this cube (can’t show you all at the same “Time”) - but you look at it, and you can see one face. That face has a height and a width. Now if I turn the cube slightly, you can see that it also has a depth - but I’ve sacrificed a little of the width to show you that. Now the Time Traveller said that this cube has its three dimensions - and without any ONE of those, it could not be here. You knew that the cube had depth before I turned it, because if it didn’t - then it would not exist - but that it also would not exist, he said, if it did not have Time. Therefore, he concluded, Time is the fourth dimension.

Now I have done a little studying of argument, and that seems to me to be dodgy - he’s named a quality of spatial dimension - the negative one at that - and states, without further supporting factors, that because Time has that one same negative quality as the first three dimensions - i.e. its absence appears to lead to the conclusion of non-existence - it is therefore the fourth dimension! Could be true - but I don’t think so.

Now I read somewhere, in a long-forgotten journal, that if you made a Möbius cube out of a solid cube by taking the opposite faces, joining them with a 180° twist, you would be in the fourth dimension! True?? I don't know. I also read, in A Brief History of Time, that there are 11 spatial dimensions, but that some of them are curled up so tightly we can't see them! I don't know what that means, but all this does rather make me think again about Time, if it is a dimension, then it's obviously completely apart from spatial dimensions.

One thing is for sure: if you accept Time as a "thing" you should observe that it is inexorable. We talk about cycles of life, deja vu, history repeating itself, what goes around comes around, and all that - but it is not so! It moves ever on! By the same principle that gravity sucks, and does not push - Time has one direction only, it moves forward only. Nothing repeats itself - everything moves on; we are on a one-way street; *if you accept Time as a thing.*

My discussions with John made me think about how we use Time references in nearly everything we do, think or say; we do complex calculations about the nature of things using Time; we use it as the x-axis in most of our graphs (although in the appalling illustrations to be found in "A Brief History of Time", the x-axis always seems to be Space, and the y-axis Time.)

The Time gap, so I discovered, from the first "found" flint tools to the first crafted flint knives and axe-heads was ten thousand years! Technology was slow for a long Time, but today - it builds upon itself so rapidly that we're in a whirlwind of invention! The acceleration is accelerating!! We can't go back; we are producing now a different generation of people that accepts and expects the constant new.

I mention these things only to emphasise again the irreversibility of the human world - because we can't uninvent anything. We can't "de-sequence" what has happened.

Let's say I want to go back in time. The molecules that make up my body are progressing through Time at about the same rate as yours. But let us say I want this body to go backwards in Time: would I reverse the motion of all these molecules? No, for surely that would lead to my getting younger and younger... And younger and younger... Can you see where this is going? I would get younger before your eyes until I reached a finale that you would probably rather not witness.

No that wouldn't work - what I would have to do is retain my status quo, and reverse the motion of every other molecule, atom and particle in the universe to where it was a second, a minute - a millennium or millions of years ago. In that way could I find myself in the world of the past, where I could walk with dinosaurs, or murder baby Hitler in his cot? No! What would happen in fact - if you can accept as a fact my reversing everything in the universe - is that the earth would leave me! Its spin would reverse, it would go back around the sun the way it came! I would be deserted in space where it used to be! And, apparently, in space, no-one can hear you scream!

Maybe I should be thinking seriously about this business of Time moving on - tempus fugit

We easily accept that Time moves forward don't we? I was doing it a minute ago, and it was perfectly acceptable for me to express it as if in our minds it had a direction. But it doesn't at all - it doesn't move forward, it doesn't move backward, up, down - it doesn't move! Everything else does! Time might be the only thing in the universe that doesn't actually move! Anyway - when you talk of Time - which way would be forward? Point it out to me. Show me Time. I think the universe progresses, but I doubt you can put a "direction" on that progression.

> First verse:-
> I'm lookin at the faraway horizon,
> An noticin the meetin of the lines,
> I'm pondering the meanin of infinity,
> An wonderin if you can tell me what it is that has become of Time.

I'm standing in the middle of a desert road in California; the road is straight and flat for as far as I can see. Because of the limitations of my eyesight - not enough pixels on the old retina - the parallel sides of the road appear to meet at the horizon. It makes me think of infinity. When the night falls over the desert and I can see the stars, I see a different horizon. I am looking at a horizon of stars and faraway galaxies - it's very grand, and I wonder if it stretches for ever to infinity. Einstein tied Time and space together permanently, so an infinity of one would necessarily mean an infinity of the other. Wouldn't it? The starlight I can see - is it coming at me from further than 13.72 billion light years away? Because from any further - given the accepted age of the universe - it wouldn't have had Time to reach me yet.

Brian Cox - and another source that I can't attribute, but it was on the BBC website - stated that the horizon for the universe is 46 billion light years in that direction and 46 billion in the other. I question this - just question it; I say it can't be right.

Let's start the universe off with a Big Bang..

WikiQuote:The Big Bang theory is the prevailing cosmological model for the development of the early universe. The universe is now expanding and cooling. Consequently, the universe was denser and hotter in the past. Further, the Big Bang model suggests that at some moment all of space was contained in a single point, which is considered the beginning of the universe. Modern measurements place this moment at approximately 13.72 billion years ago. This is thus considered the age of the universe.

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Now -

If matter could travel at the speed of light, then the furthest it could have travelled in 13.72 billion years is 13.72 billion light years. Am I wrong? How can material have shot to 46 billion light years away? - in addition to that, of course, matter can't travel at the speed of light, we have been assured. So if the boundary of the universe is at the furthest place matter could have travelled from the Bang - its horizon - then it's at something like - what - two sevenths of that distance? Or three tenths? Some fraction. It could not possibly have travelled "out of sight" as it were.

The assumption that, because the universe is expanding and cooling, it was once incredibly dense and incredibly hot, is an unsafe assumption - yet current cosmology seems to take that as read, basing it on the premise that what is now expanding and cooling must necessarily have come from denseness and hotness. Ninth Commandment of argument: Thou shalt not argue that "this follows that" just because it seems to. Or you think it should!

I will attach the ten commandments of argument at the bottom of this.

But they added more to their case, they predicted that the Big Bang would have left microwave background radiation from its earliest nanoseconds, and they found it in 1964, and it seems to prove to them categorically that the universe was once superhot; I respect their view. But if everything was in the same place at one Time - a singularity - I respectfully suggest that it wasn't moving because there was no room to move - and if it wasn't moving, then it was not hot - because the very definition of absolutely still, is absolutely cold.

Furthermore - to add to this list of problems with Big Bang theory my friend John - speaking to me years ago - said that he could not visualise a Big Bang AND a black hole in the same universe, under the same rules of physics.

His reasoning was this - that if black holes exist, then surely the singularity was the mummy and daddy of all black holes - and nothing could have ever escaped it. Fair point. I will call this critique of Big Bang Theory the Foggitt Black Hole Analogy. I add to that the following question: "What made the Bang? - what blew it up? - What was the explosive force that pushed out against that most humongous ever (apparently) gravitational force and sent everything outwards at a ridiculous velocity into infinite space?

The statement that "space is expanding" has no meaning at all as far as I can understand. I think it MIGHT mean something - but I can't understand it. I have incidentally, a similar, but greater, much greater - really great - problem with the statement: "space is curved."

Belgian catholic priest and scientist Georges Lemaître proposed what became the Big Bang theory in 1927. He didn't name it, obviously, or else it would have been called Le Grand Bang. The framework for the Big Bang model relies on Albert Einstein's theory of general relativity. In 1929, Edwin Hubble discovered that the distances of faraway galaxies were strongly correlated with their redshifts. That observation indicated that all distant galaxies have an apparent velocity directly away from us: that is, the further away, the higher the apparent velocity, regardless of in which direction we look. Now, assuming that we are not at the centre of a giant explosion, the only remaining interpretation is that all regions of the universe are receding from each other.

Thinking back, I still have a problem with the picture we were brought up with of an infinite universe. You know that picture: the universe has no end; it goes on forever with an infinite number of stars and planets in an infinite space. Consider that Douglas Adams proposed an example as follows: in an infinite universe all possibilities occur and recur: therefore there is a duplicate planet to earth in which

everything is completely identical - except that maybe the handbrake on the old Ford Prefect was a quarter inch shorter!

To sum that up: I want to know how there can be an infinite universe - or a ninety-two billion light year universe - if it all started in the same place with a singularity 13.72 billion years ago. I'm not saying there's no explanation - just that I don't know what it is. Maybe it will come when Hawking publishes his Great Universal Theory of Everything, (I know that's tautological - I just said it for effect!) Incidentally - I hope we don't discover the theory of everything here tonight - that would pee him off terribly! I do think that the current picture doesn't hang together. The more you think into it the more you sink into it.

Here is a Brief History Of Timekeeping: strangely, it seems that most of the advances in horology have been Anglo-centric. The caveman who first observed the daily course of the sun and the cycle of the seasons was probably a English caveman! Years later, when England ruled the waves, the government noticed that a huge tonnage of shipping was being lost because the crew needs to know the Time at some fixed point on earth to know how close the ship is to the Cornish coast; the old long case clock in the captain's cabin wasn't good enough. A Longitude Prize was offered to anyone who could find accuracy in mid-ocean. Clock-makers and astronomers - and maybe even candle-stick makers flocked to find a solution and claim the massive prize of £2.52 million. It was won (or largely won - it's complicated) by a pedantic, patient, self-critical genius called John Harrison; he had a struggle with the government to claim the prize, because their advisers, the Royal Society and its President, Sir Isaac Newton, seemed to favour an astronomical solution - to believe that the charting of the cycles of the moon was where the answer lay.

I recommend a book by Dava Sobel called "Longitude". In beautiful English with a dash of humour, she tells the story of John Harrison and his struggles. The book is worth reading for its chapter on the heroically named Admiral Sir Cloudesley Shovell, who managed to run, not just a ship, but an entire fleet onto the rocks of the Scilly Isles! He made it ashore, but died at the hands of the natives.

http://www.amazon.co.uk/Longitude-Dava-Sobel/dp/0007214227

When the English invented the railways, another Time challenge was encountered. Local keeping of Time across England, whereby each town hall clock was set by the noonday sun, had sufficed until now. But railways needed consistency. Trains were crashing because of the Time discrepancies between points of departure and destinations. GMT was rolled out across the land by Great Western Railway. This was the first occasion anywhere that Time had been synchronised between different locations to a single standard. There were objections. There is a clock in Bristol to this day which has twin minute hands, fixed at sixty degrees apart to show the ten-minute Time difference between Bristol and London.

In the 1930s, at the National Physical Laboratory in Teddington, England, the physicist Louis Essen developed the first quartz clock.

In a grandfather clock. The pendulum counts a second each Time it swings.

Quartz plays the same role as the pendulum, just a lot quicker (I don't mean hanging a piece of quartz on a string!) the resonant frequency of quartz is 32,768 Hz. Essen attached a clock movement to that steady vibration. Quartz watches and clocks became the norm. But Essen didn't rest on that - oh no! He invented Caesium!

Actually, Caesium had been discovered in 1860 by German scientists Gustav Kirchhoff and Robert Bunsen: it is an alkali metal from the first column of the periodic table; silvery with a golden cast; the most reactive and one of the softest of all metals. It has a melting point of 28.4C,which means it is a liquid just above room temperature. It is about half as abundant as lead and 70 Times as abundant as silver. It has a resonant frequency of 9,192, 631,770 Hz,

Essen's quartz clock was out just one second in three years. His first caesium atomic clock created at NPL in 1955 was wrong by one second in 1.4 million years. I'd have taken it back to the shop - wouldn't you?

A current caesium clock at NPL is accurate to one second in every 158 million years. The caesium clock makes satellite navigation possible. GPS satellites carry synchronised caesium clocks that enable them collectively to triangulate your position and work out where on earth you are. (And tell you to make a u-turn as soon as possible).

https://en.wikipedia.org/wiki/Atomic_clock

Caesium was always a compromise element. The next in line are strontium and ytterbium. Caesium clocks could be superseded by the "Strontium End Cap Ion Trap" clocks which could measure Time up to 1000 times more accurately.

They are actually re-defining the second here. For the first time in human history, the rotation and the orbit of the earth no longer define Time.

So we're getting very good at it - at least they are in Teddington.

Now, one might very well wonder why such insane levels of accuracy could ever be required. Why would we want to know the Time to as close as one second in 15 billion years - which is what the strontium clock promises?

Consider electricity grids; high speed trains; the internet; smart bombs and defensive missile systems which need phenomenal degrees of time accuracy; space travel; air traffic control, the list goes on..

However - the biggest target is the financial markets, which, in modern times are dominated by computers which are programmed to place millions of trades per second, transmitted down wires at almost the speed of light.

In this world, the equivalent of a train crash would be ill-timed bets that rack up millions of dollars in losses, and might even sink the markets - or a country - in the process. The financial regulators require a super-accurate Time stamp on every transaction. So there you are - it all comes down to money!

I shouldn't really suggest all advances in horology were made in England - other nations have made their contribution - I give you... the cuckoo clock! And the Mickey Mouse watch!

http://www.amazon.co.uk/s/ref=nb_sb_ss_c_0_12?url=search-alias%3Daps&field-keywords=cuckoo+clocks&sprefix=cuckoo+clock%2Caps%2C243&rh=i%3Aaps%2Ck%3Acuckoo+clocks

http://www.amazon.co.uk/s/?ie=UTF8&keywords=men%27s+mickey+mouse+watch&tag=googhydr-21&index=aps&hvadid=84676162494&hvpos=1t1&hvexid=&hvnetw=g&hvrand=13166001742171989326&hvpone=&hvptwo=&hvqmt=b&hvdev=c&ref=pd_sl_6mtd310f5n_b

BREAK

Isaac Newton was born at an interesting Time. 25th December 1642 and 4th January 1643. He died aged 84 on the 20th March 1726 and 31st March 1727. Why there is a ten day gap in his birth dates, I can tell you, why there is a one year and eleven day gap in the death dates, is more complex. It was, of course, the terrible Time in history when the general population believed that the powers-that-be (that would be the Catholic Church) had robbed them of eleven days of their lives! There were two calendars running, and they were ten days apart in 1642, but by 84 years later the Time-slip was eleven days and the year had been adjusted too. Einstein had Newton's picture up.

Newton was a genius because he not only used his talent to fantastic effect - founding his own branch of mathematics to do it - but also because he was aware there was so much more. He described himself as "a boy playing on the sea shore and diverting myself in now and then finding a smoother pebble, whilst the great ocean of truth lay all undiscovered before me." So to this day the Great Universal Theory eludes us - it will combine Space and Matter and Energy and Gravity and Time... S-M-E-G-T, SMEGT - or at least I think it will. It seems that somebody needs to work out the mathematics of the combination of those things.

Here is the John Archibald Wheeler quote I promised earlier...

We live on an island surrounded by a sea of ignorance. As our island of knowledge grows, so does the shore of our ignorance.

Michael Faraday was not very good at mathematics - a quality he shared with me. He was a fiddler and fusser and a finder-out. In the absence of a way to express himself in numbers he drew lines! His lines showed invisible fields of force which combined the previously separate disciplines of electricity and magnetism. He gave us electric motors; and generators - the modern world, actually. Others later put numbers to his work. Einstein had his picture up too.

Which brings me to Einstein. He combined the ideas of space and Time in the way Faraday had combined electricity and magnetism.

Einstein's former teacher Hermann Minkowski - who didn't much care for him as a student - said after the publication of the Theory, "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." Cute.

According to Einstein's Relativity, if I stand literally on his shoulders, my watch will go faster than his. It seems that it's true, because we know that difference in elevation has to be taken into account by the on-board clocks in satnav satellites. So time is different at different elevations above the earth? - I'm worried about this Time noun, you know. Let's do an experiment...

Einstein had an amazing quality that he shared with Leonardo da Vinci - and probably Newton as well: it was to do with the way the left-right brain communications worked. Einstein did have Asperger's; he had imagination as well as mathematics. He used thought-experiment. He imagined himself travelling on a light beam. He was looking at the town hall clock, which said three o'clock, and then he was hurtling backwards from it at the speed of light! He observed that the clock continued to say three o'clock - because that was the particular light beam he was on. Has he thus made Time stand still? I believe that's the claim, isn't it, that if you travel close to the speed of light you slow Time down? (and as a side-effect, become enormously heavy, and extremely short!)

Ralph Waldo Emerson, whose contribution to mankind seems to be just a series of quotes, said...

Science does not know its debt to imagination.

Anyway - back to Einstein's amazing journey from the town hall clock; I considered this some more - I extended the thought-experiment. I imagined another clock - set apart from the first one, in the direction Einstein is travelling. This clock is synchronised with his, and it stands 100 million miles away from it. That's about, what, very roughly, ten minutes away at the speed of light - not far.

So when Einstein arrives at my clock - with his clock still apparently saying three o'clock - what does mine say? Ten past three, isn't it? Seems fair enough. Now I'm going to ask Albert to make his journey again, from his clock to my clock - but this time, before he starts, he turns around to look at my clock. Now, what time does my clock say? Yes, ten to three. He is seeing light ten minutes old. Now he makes his journey and arrives at my clock. What time does my clock say? Yes, ten past three - same as before. But if he was looking at it all the way, he will have seen it move from ten to three to ten past three in ten minutes - so has he thus made Time travel at twice the speed? This whole business that I read of that Time varies according to where you view from, I find confusing. If Time is anything, surely it must in some way have some sort of constant value? It must be anchored somewhere. But if I'm in a different

place from you, like up on your shoulders - or in a satellite, then we are keeping different times.

BTW do you think, as I do, that three o'clock in the afternoon always seems to be either too early, or too late, for anything you want to do?

The speed of light I find enigmatic, too. By the way, do you know what the speed of light is? I conducted my own experiments, and I discovered that it travels at 1.8×10^{16} furlongs per fortnight.

I am travelling in my car, with my child in the back, and the child fires a pop-gun at my head, which sends the cork at, let's say, ten miles per hour. Now, an observer on the pavement outside the vehicle will see that cork travelling at... the speed of the car - thirty miles an hour, plus the speed of the cork - ten miles an hour, which makes forty miles an hour in total. This is a fact. Now, I go round the block, and this time my child is armed with a laser-pen. She aims it at the back of my head, and the observer sees the light beam travelling at... What thirty miles an hour plus the speed of light? No, apparently not. The light beam is unable to exceed 186,000 miles per second even if the source is moving.

If I'm in my rocket-ship, travelling at the speed of light, and I turn my headlights on, what do the people in the vehicle ahead of me see? What do the people at my destination port see? If I turn on my tail lights, what do the people behind see? If I'm closely following another ship at the speed of light - and his brake-lights come on! What then? How long have I got?!

Einstein has been followed by a lot of men who probably have his picture up. Edwin Hubble was one, of course, the genius ex-lawyer who confirmed the expanding universe. Today we have Lawrence Krauss - a man whom I have watched a lot in debate and lecture; Stephen Hawking and Penrose and a hundred others at the forefront of this scientific endeavour. Brian Cox - not always taken seriously, but has won awards for his science presentation and who works at CERN - has certainly made me think about the explanations for how things are. Hawking, for a long Time, has been seeking that Theory of Everything - to combine all the elements of the existence of the universe together in one equation that explains all we need to know about our origins and to project us forward into a dynamic future; to combine the very large with the very small.

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In Times past, the argument between the creationist and the scientist went as follows: creationist says, "Oh, so you think the universe just appeared out of nothing, do you?" to which the scientist replies, "No, I don't know how it appeared - but it is you that thinks it was conjured out of nothing!"

Now, after Lawrence Krauss and others, we have a different conversation, because in reply to the same question, the scientist now says, "Yes! The universe DID come from nothing! If you smack nothing hard enough, you get a universe!"

I will put a link to Krauss, you will enjoy him, he is often called the Woody Allen of cosmology,

https://www.youtube.com/watch?v=EjaGktVQdNg

but I must explain that he has a different - very different - definition of nothing to yours or mine! To him, nothing is a seething mass of particles and anti-particles coming into existence and cancelling each other out. To him, a positron is actually an electron which is going back in Time! There is no such thing as nothing, he is really saying - and he is not now alone in that opinion.

> Second verse:
> Im lookin through the microscope of reason
> An noticin the origin of lines
> Im ponderin the meanin of uncertainty
> An wonderin if you can tell me what it is that has become of Time

This micro world - in which the giants are seeking the answers - is a mystery to most of us. Things are happening down there which seem to defy reason - like the electron being in two places at once, for instance (that seems to defy a Time-governed explanation) or, similarly, a photon of light passing through two slits simultaneously. There are problems with the micro-world: if you know the speed of something, you don't know its position - or if you can observe something occurring, then it is not behaving in the same way as if you were not observing it. This makes knowing what is going on very difficult!

Planck joke ...

Before I leave this micro world for a while, I must tell you about the model of an atom I heard of: if I had a marble, and represented the proton of a hydrogen atom with it, then the electron would be represented by a sphere the same diameter as a human hair (yes I know an electron is probably an electro-magnetic wave, but stay with me!). Now, I send this tiny sphere on an orbit around the marble and there we have it - a fully functioning model of an atom. Now how far do you think the electron would be from the marble? Radius of orbit? At this scale? Well, it's two miles! Is that incredible? It does indicate that there is a lot of space inside every atom in the universe - but even so - to think that all the matter in the universe (de-formed and crammed together) would fit inside the singularity - of which more later - is impossible to conceive, I suggest. I have heard of a sugar-cube from a neutron star weighing 1 billion tons - but the singularity...? Everything...? A hundred billion galaxies averaging three hundred billion stars..? Plus all that intergalactic dust the Hubble telescope has shown us... And then ten times as much again of dark matter... all in there... Really? I don't think so.

If I take a picture of you in this room, then you tend to think I am recording a snapshot in Time - the Adstock Science club, this date, caught for posterity. But when you think that I am recording light from the back of the room that is older than the light from the faces in front - you kind of get to thinking that I am taking a slice of space/Time into my camera. If I point it at the stars, then we can understand more easily that I am taking a picture across billions of years.

I would like to tell you something about Mr John Foggitt that he might not have told you. He has coined a word! Not so easy as you might think - to coin a word that is etymologically perfect; has no synonyms, and is a perfectly useful English word - but that is what he has done! I congratulate him. The word is... “achronotisation”. It is, if I need to tell you, a word which is parallel to acclimatisation - but referring to changes in Time-zones rather than environments. Good word!

Georges Lemaitre, thinking about the scenario he had figured out of Le Grand Bang, said, “The universe must have had a day without a yesterday.” This is a very fanciful, poetic, but nonetheless silly way to describe that situation. First of all, days weren’t invented back then - and secondly he is making what was possibly the first reference to the beginning of that scientific Time - when he had no empirical basis on which to. Einstein conjoined Space and Time in his formulations; did he mean you could not have Time if you did not have Space, which was the proposed situation at the moment of the Big Bang - and which supports Lemaitre? OR did he mean you could not have Space if you did not have Time? A different proposition. An idle musing.

Third verse:
Im lookin through the telescope of wisdom
An noticin the destiny of lines
Im ponderin the reason why there’s gravity
An wonderin if you can tell me what it is that has become of Time

Let’s travel in Time, despite what I say. Let’s go briefly in the direction of the future! If the wreckers and the vandals of this world don’t lead us to self-destruction, it is probable that we could live peaceably until the world declines towards its natural end: maybe the Andromeda Galaxy will close in and collide with us - that will be something, eh? I can’t wait to see that!!! - or maybe, before that, the sun will expand and engulf us. I see the image that H.G.Wells’ Time Traveller described, with the red sun half-filling the sky, setting on a dead ocean, and a few unknown crab-like creatures shuffling along the beach, chasing huge butterflies. The earth; the solar system, will die.

After that the expansion of the universe will spread all matter and energy out into almost infinity until the ambient temperature closes in on zero like one of those graph lines getting closer and closer to the asymptote. I have a little difficulty imagining that everything will separate to an even distribution, but it’s academic, we won’t be around to know one way or the other. Time, if it exists, will be eternal. Hmff. But pointless. Will it be said to exist in any meaningful way in that vast emptiness of matterless inaction?

“Ah! Eternity,” said someone, “thou pleasing, dreadful thought! What is the future but endlessness?”

And if we go back towards the previous?

A billion seconds ago, it was 1984.
A billion minutes ago it was 155 AD
A billion hours ago that English Caveman looked out and wondered what time it was!

Here is a WIKIquote that I will not try to explain - but it has some relevant words in it: The classical version of the Big Bang cosmological model of the universe contains a causal singularity at the start of time (t=0), where all time-like geodesics have no extensions into the past. Extrapolating backward to this hypothetical time 0 results in a universe with all spatial dimensions of size zero, infinite density, infinite temperature, and infinite space-time curvature.

So let's go there - let's extrapolate - all the way! I know I said that it can't be done, but I have found a way ... there is CCTV footage of the entire universe from its beginning - and I am simply going to play it backwards to view it! I will mention a few interesting events along the way. First we go to somewhere between 100 and 250 thousand years ago... Homo Sapiens... Wise Homo! (In the Latin sense and not the Greek!) We first appeared somewhere in that Time frame; and ever since then our frontal lobes have been enlarging to make us the intelligence powerhouse you see before you today! There is a way to go! Now we go back 600 thousand years; that was when the largest volcano on earth erupted for the third Time, throwing up dust and causing catastrophic loss of sunlight and the extinction of thousands of species. This was, of course, Yellowstone Park. 600 thousand years before that was its second eruption, and 600 thousand years before that - the first! This means that the fourth eruption is due (checks watch) round about now! From 1800 thousand years ago, we go to 2.8 million years; the very first hominids were at large, oh what a future they had! (Once they'd evolved into homos) A little further - to 3.2 million years - to Lucy; lovely girl, but a hominin - small and perfectly formed - I don't know how they knew her name, perhaps there was some ID on the body!

Now a giant step in Time! 65 million years back - the unexplained extinction of the dinosaurs. They had roamed - and mostly ruled - across the world for 200 million years - and on that day, they were gone! What's all that about? Most things have died out on this random earth of ours. The current extinction rate of all fauna and flora is 99.8%! Including all but one of the homos - fortune favours the lucky!

Four and a half billion years ago - the earth was formed in the violent fire of a chaotic solar system.

Now we have lost the earth we have to start counting from the other end: Sometime between 150 million to 800 million years after the Big Bang the first discernible galaxy formed.

Going back before that, at 380 thousand years after the Big Bang, the lights came on , before that there was blackness - opaque matter; dark energy.

Another WIKIquote: at 0 to 10^{-43} second after the Big Bang there was the Planck epoch, when the temperature was so high that the four fundamental forces—electromagnetism, gravitation, weak nuclear, and strong nuclear - were one fundamental force. Little is understood about physics at this temperature; different hypotheses propose different scenarios. Traditional big bang cosmology predicts a gravitational singularity before this Time, but this theory relies on general relativity and is expected to break down at that temperature due to quantum effects.

But let's just come forward to the time after...

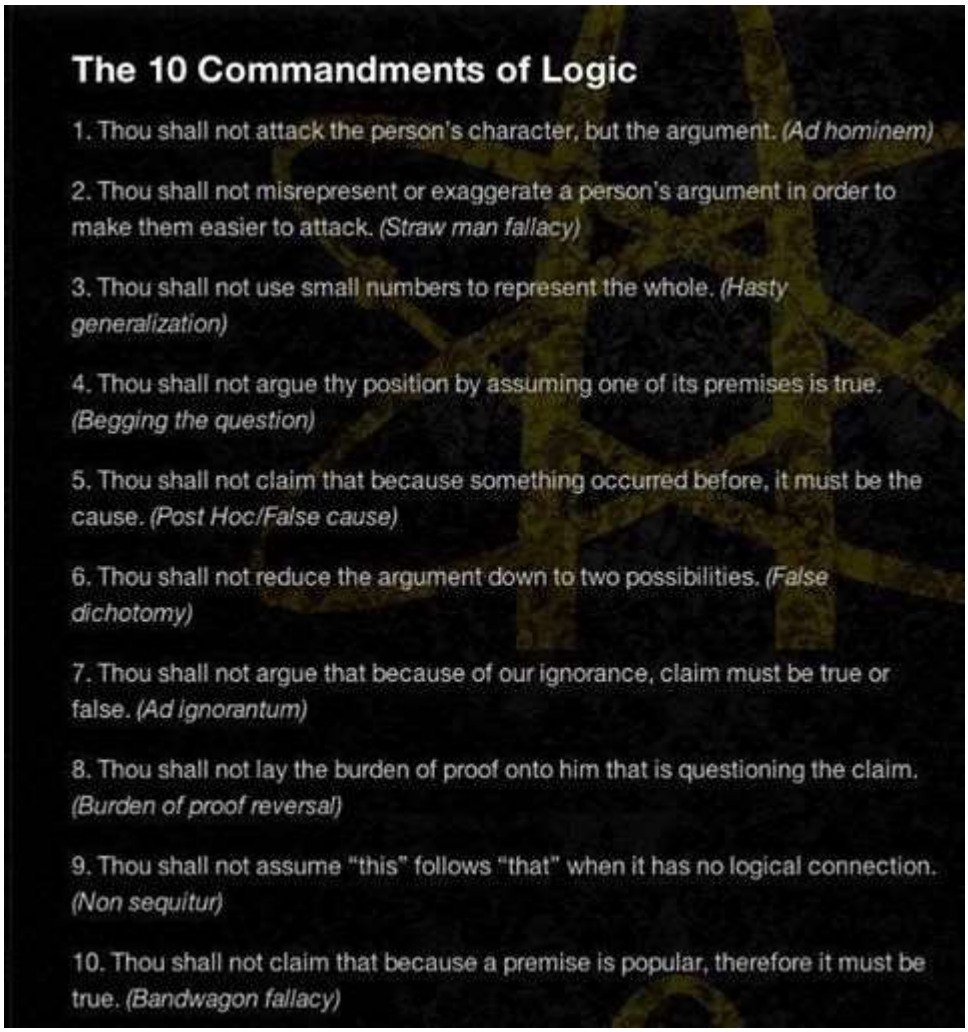
As we approach that Planck epoch - it appears we have just hydrogen atoms, gradually - in our reverse scenario - deconstructing into energy/particles. We now have everything that eventually made up the universe condensing fast and heading towards the vanishing point that is the singularity - and it's getting quite exciting!

The final contraction in the Planck was faster than the speed of light, they say - contraction to a single point - not somewhere in space - but everywhere. What is that singularity? What size, what form? Smaller than a world, or a marble - or even, as suggested, smaller than a proton. Just a dot? Singularity.com. Why not all the way - to nothing? A true dot has only one dimension. What is inside this dot - if it is large enough to have an inside? I check the dot with my mnemonic: SMEGT:- Space, matter, energy, gravity and Time. S - Space? Does the singularity have Space? - well, not much - but then, is it bigger on the inside, Doctor? M - Matter? Well - this is where the hypothetical singularity is not the mummy and daddy of all black holes, because there is no matter whatsoever - probably. E - Energy? Has it all changed to Energy? Hmmm, not sure about that - how much energy can be contained in a non-space - I will tell you one thing: an electro-magnetic wave cannot be contained in a space smaller than its wavelength. G - Gravity? Well, no. No matter, no gravity... (I quoted a minute ago that traditional Big Bang cosmology predicts a gravitational singularity before this time - but surely a "gravitational singularity" takes us back to Foggitt's Black Hole Analogy? Nothing could have got out!!) It might be - and here's an idea for you - that the elusive equation which combines and explains all things somehow describes a gravity which PUSHED, instead of sucked, in that early scenario - so causing that massive faster-than-light inflation that we don't understand! How about that? .... And so here we come, finally, to T is for Time.

If I ask Professor Hawking what happened before the Big Bang, he says, "it is meaningless to talk about "before the Big Bang", because Time did not start until the Big Bang." I'm sorry that makes me think of a disparaging adjective. Spoken without thought - I believe - for what is implied. If you think Time exists - and you think it can be evidenced independent of matter in motion - then how can you know that it came into existence at the Time of the Big Bang (an unknowable occurrence) and did not exist before? - That it can only exist afterwards when there IS matter in motion? You can't have it both ways. Here's the crux of the matter. I'm coming to my vanishing point... Time didn't exist before the Big Bang; I will give you that, but neither did it exist during the Big Bang, or after the Big Bang. It never started. It can't start. You can't start Time. There's no such thing as Time.

And I am going to make a further statement - which you are entitled to think is only conjecture - if Time is a non-existant, then maybe you should preclude it from your calculations about existence. As a layman I admit I don't see how that could be done. But, maybe it is not until you remove Time from your equation that you will finally come up with the Theory of Everything!

And on that bombshell, I leave you to your own thoughts on the subject, and I thank you for listening.


The 10 Commandments of Logic
1. Thou shall not attack the person's character, but the argument. (Ad hominem)
2. Thou shall not misrepresent or exaggerate a person's argument in order to make them easier to attack. (Straw man fallacy)
3. Thou shall not use small numbers to represent the whole. (Hasty generalization)
4. Thou shall not argue thy position by assuming one of its premises is true. (Begging the question)
5. Thou shall not claim that because something occurred before, it must be the cause. (Post Hoc/False cause)
6. Thou shall not reduce the argument down to two possibilities. (False dichotomy)
7. Thou shall not argue that because of our ignorance, claim must be true or false. (Ad ignorantum)
8. Thou shall not lay the burden of proof onto him that is questioning the claim. (Burden of proof reversal)
9. Thou shall not assume "this" follows "that" when it has no logical connection. (Non sequitur)
10. Thou shall not claim that because a premise is popular, therefore it must be true. (Bandwagon fallacy)