A CRITICAL EVALUATION OF MODERN PHYSICS

By Claudio Voarino

A Few Words of Introduction

In his article, *Science and the Mountain Peak,* Professor Isaac Asimov wrote: "There has been at least one occasion in history, when Greek secular and rational thought bowed to the mystical aspect of Christianity, and what followed was a Dark Age. We can't afford another!" I don't think I am exaggerating when I say that, when it comes to Modern Physics (also known as New Physics), we have indeed been in some sort of intellectual dark age, whether we can afford it or not. In fact, we have been in it since the end of the 19th Century; and this is when Classical Physics started to be substituted with Modern Physics. This despite the fact there were lots of instances that clearly show the absurdity and science-fictional character of most of the theories of this kind of physics, which I will be discussing in details further on in this article. But for now, the following few examples should prove the correctness of my opinion on this topic. Incidentally, for the purpose of this article, the word 'physics' means mostly 'astrophysics'. Also, whenever referring to modern physicists, I think it is more accurate to add the adjective 'theoretical' before the word 'physicists'. I am saying that because I just cannot associate the main tenets of Relativity and Quantum Physics theories with physical reality. The following example should attest the truth of my statement. Back on September 10, 1989, the Australian newspaper *Sunday Telegraph* carried the following bizarre article entitled *Keep Looking or the Moon May Vanish.* Here how it goes: "We now know that the Moon is demonstrably not there when nobody looks at it." No, this isn't a joke or a line from the book *Alice in Wonderland*, but the words of astrophysicist David Mermin, from Cornwell University in the United States. This is an implication of Quantum Physics, according to which the Moon or any other physical object exists only because we observe it. This means that if nobody looked at our natural satellite, or at anything else, it would physically cease to exist. Surely, this has to be one of the most absurd, bizarre, and unscientific statement in the world! Likewise, Special and General Theories of Relativity - another two cornerstones of Modern Physics - have their fair share of illogical and science-fictional theories - and trying to debunk them is the main purpose of this essay.

For many decades, physicists, cosmologists, and some other men of science with a metaphysical-theological bent, have made pronouncements to the effect that recent scientific discoveries have validated the truth of theistic religions. Theologians and the mass media have extended and distorted these pronouncements; as a result, millions of people have derived the impression that science confirms practically most of the Book of Genesis. However, normally these claims cannot stand any serious scientific investigation. A staunch proponent and propagandist of the Big Bang theory and creation from nothing was the late American physicist and professor of astronomy, Robert Jastrow. He was the author of the book *God and the Astronomer*, as well as various articles. Professor Jastrow wrote: " … the scientist who has scaled the mountains of ignorance, is about to conquer the highest peak, and as he pulls himself over the final rock, he is greeted by a band of theologians who have been sitting there for centuries." Here what he meant was that the Book of Genesis was right, and while the theologians knew all along that the Universe began very suddenly in what is called the Big Bang. But scientists, to their great dismay, had to learn this scientific fact the hard way. Jastrow's metaphorical piece of fiction about scientists scaling mountains is quite charming, but it has nothing to do with Physical reality. Perhaps Jastrow should have been reminded that, according to most cosmologists, the Universe is about 15 billion years old, and the Earth was not created on October 23, 4004 B.C. as Irish Archbishop James Ussher declared about 400 years ago. In fact, it wasn't created but formed about 4.5 billion years later. I don't know where Bishop Ussher got this information but, as a churchman he had the right and duty to support his religion, just like physicists and cosmologists have the task to find out scientific truths and facts. But, unfortunately most of them seemed more interested in bridging the immense gap between science and religion - reason and faith. However, so far, their efforts have been fruitless. In any case, even if a link between science and religion could be found, its strength would be directly proportional to the degree of deterioration undergone by reason, commonsense, and science. Here by the word 'reason' I mean the kind of reason whose antonym is 'faith' - certainly not the 'pure reason' of the proponents of philosophical idealism.

For many decades the majority of astrophysicists and cosmologists have been busy promoting established pseudo-scientific theories and concepts which, although mathematically acceptable, have never been adequately tested (let alone proved), and have often made a mockery of rational thinking, logic, common sense, and physical reality. It is perfectly understandable that theologians, idealist philosophers, creationists, other religionists, and some simple-minded people should consider the concept of 'creation from nothing' as something which has actually taken place. But when physicists, cosmologists and other scientists support the same mythological belief, there must be something drastically wrong in the way they reason! Also, to add insult to injury, some of these "scientists" who put these theories in writing, have been very handsomely rewarded! This has been especially the case when they included the word 'God' in the titles of their books. For example, in 1995, Australian physicist Paul Davies was awarded one million US dollars 'Templeton Prize' for breaching the barrier between physics and religion. One million US dollars is a very large sum of money, which could have been used to save the lives of the 25,000 children who died of abject poverty every day. But these sort of things cannot be expected in the sort of world we live in! For those who have never heard of the Templeton Prize, it is an annual award granted to a living person who, 'has made an exceptional contribution to affirming life's spiritual dimension, whether through insight, discovery, or practical works.'As it happened, Prof. Davies received this award because of his two books entitled *God And The New Physics* and *The Mind Of God.*

Here we have a physicist who believes in a disincarnated deity that has always existed in total nothingness, and out of the blue decided to create the Universe. This reminds me of the Church Father Tertullian (150-225 A.D.) who wrote in *De Carne Christi*: "And the Son of God died; it is by all means to be believed, because it is absurd. And He was buried and rose again; the fact is certain because it is impossible.” There is nothing wrong with a religious person subscribing his/her beliefs, but I have a problem with the so-called scientists who adhere to the same mythology. I read bits and pieces of the *Mind Of God* but I found nothing in it to keep me reading the whole book. Also, I can’t really see how these two books could have helped breaching the barrier between science and religion - reason and faith.

Dr John Mood - who holds a master’s degree in theology and a doctorate in philosophy and literature - reviewed Professor Davies’ book *God And The New Physics,* and here are two of his comments: “It is all here - quarks, miracles, the Big Bang, the soul, quantum theory, time, black holes, God, relativity, free will, super-symmetry, the mind, the anthropic principle, creation, and galaxies - all thrown together in one indigestible stew. Also: “The fundamental error of confusing different historical epochs and mixing different disciplines underlies many statements by Davies that I found completely insupportable. For example, he thinks that black holes and gravity waves are non- material, that maths enable scientists to describe things beyond the power of human imagination, that life is unlikely in the universe, that ‘minds’ other than our own can be known only by analogy, that there can be disembodied minds, and that computers can be intelligent beings.” Dr Mood ended the review of Davies’ book by saying: “The problem is not just Davies’ - it affects most philosophers between Plato and Nietzsche as well. If you are an astronomer with a religious or philosophical bent, I cannot help you. Perhaps you do what I have done - gave it up altogether for poetry and music, and observing the heavens. There you might find the original meaning of the word philosophy - ‘the love of wisdom’, but you certainly won’t find it in this book.” Prof. Davies isn’t certainly the only physicist who realised the money-making potential of mixing science with metaphysics and theology. In fact, during an interview on television - discussing the sales of his book *The Mind of God* - he remarked: “… There is a huge market out there.” There certainly is, but only for authors who put financial gain before truth.

Metaphorically speaking, Copernicus, Galileo, Kepler, Newton, and other true scientists of the past, who dealt with physical reality, would turn in their graves if they could see what a farce Modern Physics has become! (In fact, there is a book aptly entitled *The Farce of Physics*, written by the late American author Brian Wallace). During his life, Galileo was involved in the ideological war with the Catholic Church - a ‘war’ he won, thus bringing the science of cosmology out of the Dark Ages. Now, nearly four centuries later after his death, true science needs to be rescued again. Galileo, Newton, and Kepler, for example, first conducted observations and made cosmological discoveries, and only then they used mathematics; but only as an implement with which to obtain the maximum amount of information from their observations and experimentations. On the other hand, most of today’s physicists and cosmologists, ‘put the cart before the horse’, so to speak. This shouldn’t surprise anyone, because the proponents of Modern Physics have been doing the same for the past 120-odd years. In other words, their theories are not based on observation and experimentation but on mathematical formulae, assumptions, hypotheses, metaphysical disquisitions, and religious belief.

Unfortunately for the advancement of real science, one of the main troubles with Modern Physics, is that there have been (and still there are) too many theoretical physicists but not enough practical ones. In his book, *How Einstein Destroyed Physics*, Dr Roger Schlafly, Ph. D., tells the truth about how modern physics became science fictional: "Modern physics has been taken over by academic researchers who call themselves theoretical physicists but who are really doing science fiction. They are not mathematicians who prove their results with logic, and they are not scientists who test their hypothesis with experiments. They make grand claims about how their fancy formulas are going to explain how the world works, and yet they give no way of determining whether there is any validity to their ideas." I agree with Dr Schlafly, but for one thing - the damage done to Classic Physics wasn't done by Einstein alone, but also by the theoretical physicists and cosmologists of his time, and worse still, by those of the recent past and the present. At least Einstein had some doubts about the validity of 'pure' mathematics, as well as about some tenets of *Special Relativity*. On the contrary, most of today's relativists still believe in this kind of doubtful concepts (see the Section *Einstein's Doubts, pg22*).

As it happened, modern physicists with a theological-philosophical inclination have created a new religion, the 'high priests' of which have managed to turn scientific thought into a system corrupted by metaphysics, theology, and the excessive use of pure mathematics. The irrational and unscientific behaviour of most modern physicists is masterly described by N. Rudakov in his book *Fiction Stranger Than Truth*. In 1981, he wrote: "In the last sixty years physics has been enslaved by theoreticians who have succeeded in abolishing physical reality and replacing it with an empty and barren mathematical formalism. The new physicist no longer studies nature and describes what he has observed in physically meaningful terms. He sits at the desk, manipulates abstract symbols and figures, and communicates what the universe is like and how it ought to behave in the form of equations which are comprehensible only to a very small and exclusive group of theoreticians like himself."

Unfortunately, for the sake of truth and scientific knowledge, the gurus of Modern Physics have always relied too much on pure mathematics when attempting to "prove" their bizarre (to put it mildly) theories and postulates. Some of these pseudo-scientific, meta-theological articles and books, which have made their authors rich and famous are the expanding universe, space-time, curved space, the 'uncertainty principle', vanishing Moon when no one looks at it, black holes, white holes, worm holes, alternate universes, quarks, infinite distortions of space and time, catastrophic infinite contractions, infinite density of matter, singularities, zero length and infinite mass, disappearing of matter from space, creation from nothing, and the splitting of the whole universe into a number of parallel universes. Be that as it may, I think most of the theories of Modern Physics were (and still are) developed from psychological and religious premises not scientific ones. Therefore, they deserve no place in the serious endeavour of real science!

In his book *The Big Bang Never Happened,* American popular science writer Eric J. Lerner wrote: "The Church Fathers Tertullian and Saint Augustine introduced the doctrine of creation *Ex Nihilo* as the foundation of a profoundly pessimistic and authoritarian world view." No doubt, if these two 'pillars' of the Catholic Church lived now they would be delighted to know that most modern cosmologists are on their side. That is, they too believe that the Universe and all it contains is finite, and was created by an eternal spiritual creator. They also maintain that the perfect initial state of the Universe has been slowly but surely deteriorating. Whatever has had a beginning will eventually have a catastrophic end; and this is what the Second Law of Thermodynamics implies. In a few words, this Law states that in a closed system 'entropy' tends towards a maximum - there is an increase of randomness, a tendency towards equilibrium, which results in a decrease of available energy. Much more will be said about the nature of entropy and related topics in the section about the Big Bang Theory. For now, I just say that a high increase in entropy can eventually lead to the so-called 'heath death' of the Universe. This is one type of possible catastrophe; the other type being the 'Big Crunch', which is the opposite of the Big Bang. This catastrophe will only happen in an 'Oscillating Universe'. For many decades, cosmologists and theoretical physicists - basing their theories on the Second Law of Thermodynamics - have been declaring that the Universe is running down like clockwork. This has led theologians, philosophers, and even the general public to say that there must have been a creator who 'wound up' the Universe in the first place. And this great energy winder is the Judaeo/Christian God.

In conclusion to this preface, I like to make it clear that the main purpose of this article is to examine some of the tenets and theories of Modern Physics from a rational, commonsensical, and scientific perspective. Some mathematics will be used but not the type that can be skilfully manipulated to appear to verify almost any claim, no matter how irrational and unscientific.

PART ONE

Concepts and Physical Reality

At this point, I think that a few words of clarification about the big difference between a 'concept' and 'physical reality' are in order, as this important subject is doesn't appear to be properly thought in high schools and universities. The word concept has many synonyms; some of them are: 'idea', 'theory', 'abstraction', 'hypothesis', 'belief', 'opinion', and 'conception'. A thing qualifies as a 'physical reality', only if it can be seen, heard, touched, and/or measured. Theoretical physicists and cosmologists don't often differentiate between ideas and physical reality. Physical reality is the opposite thing of a concept. Concepts, ideas, theories, opinions, etc. are abstractions, and as such, they have no physical existence, but only a conceptual and contingent "existence". An imaginary thing is also a concept invented by the human brain. Physical reality can either be natural or artificial (man-made), but concepts have always a human origin. Although collectively called 'mind', thought, memory, and feeling are functions of the brain too. The pre-Socratic natural philosophers were conscious of the above truths and facts, which is more than it can be said about today's proponents of Relativity and Quantum theories, as well as other concepts of Modern Physics in general.

Generally, both Relativity and Quantum theories are based on concepts, assumptions, hypothesis, presumptions, suppositions, imaginary physical experiments, and thought experiments. One of the negative attributes of Special Relativity is its dubious scientific content. That is, there little that is scientific in it. In order to make up for it, Einstein frequently introduced 'though experiments' during crucial stages of his argumentation. An example of these experiments is the procedure for the synchronization of remote clocks. Talking about this procedure, Einstein commented: "Thus, with the help of certain physical experiments, we have settled what is to be understood by synchronous stationary clock located at different places." This statement contains two impossibilities: 1) either an experiment is physical or it is imaginary - it cannot be both; and 2) an imaginary experiment cannot settle anything in the physical world! In other words, 'thought experiments' have serious limitations - therefore, they certainly are not equivalent to practical tests. Figuratively speaking, an imaginary experiment cannot more have an effect on matter than any imaginary knife can slice a real loaf of bread! This 'imaginary knife' is an example of a 'concept', and the real loaf of bread is an example of 'physical reality'. Poverty, for example, is a concept, but poor people are a physical reality. Time is another concept contingent on the brain; therefore, it could not have had a conceptual existence before the advent of the human race. More will be said about 'time' in a section below. Here it should be understood that whenever we use the phrase 'the concept of', we are referring to a certain creation of the human brain.

The Concept of Mathematics

Mathematics is the logical study of numerical and spatial relationships. It is usually divided into 'pure' and 'applied' mathematics. In pure mathematics the general theoretical principles are studied in abstract. In other words, it is a concept which doesn't generally refer to physical reality. This branch of mathematics pertains mainly to Modern Physics. For those who may be interested, the main branches of 'pure mathematics' are: arithmetic, tensor calculus, absolute differential calculus, algebra, trigonometry, geometry, logic, number theory, and non-Euclidean geometry. Some of the branches of 'applied' mathematics are: computer science, chemical engineering, aerospace engineering, electronics engineering, optical engineering, mechanical engineering, and the mathematical theories of conventional astronomy.

From the historical point of view, the ancient Egyptians, Sumerians, and Chinese were all using a form of abacus to carry out calculations for thousands of years before the Christian Era. But it wasn't until the 9th Century A.D. that the Persian scholar and genius Muhammad ibn Musa al-Khwarizmi introduced the idea of writing down calculations. The Venetian mathematicians of the 11th and 12th centuries were largely responsible for the introduction of these methods to the West, when it started to emerge from the Dark Ages. However, the application of mathematics to the physical sciences was mainly a 16th Century development inspired by Galileo Galilei. It is from this development that mathematics greatly progressed.

Mathematics can be a very useful, but its usefulness and practical value are directly proportional to its ability to deal with physical reality. Of course, many mathematical formulae have achieved great significance in true science, but mainly in those scientific phenomena that can be proved rationally and scientifically - that is, any physical situation which contains measurable and verifiable elements. However, sometimes some problems can occur during the translation of complex physical occurrences into understandable means of expression. Applied mathematics is great for analysing and describing physical phenomena that occur in those parts of the micro and macro-cosmos which are within the range and capabilities of man's detecting, measuring, and testing instrumentation. In short, applied mathematics has been of paramount importance in almost all practical fields of human endeavour. Most certainly, the same cannot be rightly said about pure mathematics. That is, because of its abstract nature, it has been (and still is) of little use in the physical world. For example, tensor calculus, absolute differential calculus, non-Euclidean geometry, and imaginary numbers are not going to be of much use to the engineers who design computers, photographic lenses, car engines, aircraft, spacecraft, or satellites. Fortunately for the safety of all those who travel regularly by car, train, bus, plane, or ship, the engineers and scientists who design these commercial means of transport make use of 'applied' mathematics, not 'pure' mathematics. Also, unlike past and modern theoretical physicists and cosmologists, these engineers don't base their very important work on imaginary experiments, suppositions, hypotheses , beliefs, assumptions, and/or metaphysics.

Albert Einstein himself, in an address to the Prussian Academy of Science in 1923, declared: "As far as the propositions of mathematics refer to reality, they are not certain; and as far as they are certain, they don't refer to reality." At first, this statement appears to be too generic, but obviously Einstein wasn't referring to 'applied mathematics', but to the kind of pure mathematics used in Special Relativity, Quantum Physics, and other theories of Modern Physics. All the same, it was a mistake for him to lump together 'pure' and 'applied' mathematics. Be that as it may, in 1933, Einstein contradicted himself by saying: "It is my conviction that pure mathematical construction enables us to discover the concepts and the laws connecting them, which give us the key to the understanding of nature." Incidentally, here the verb 'to discover' is out of place; that is, 'concepts' are not discovered, but originated in and by the human brain.

Einstein wasn't the only mathematician who sometimes criticized mathematics. Some other mathematicians and physicists openly admitted that mathematics has limitations as far as proving physical phenomena. For example, the well-known Danish theoretical physicist, Holger Nielson, proved the unreliability of mathematics by adding garbage to established mathematical laws, then, by clever manipulation, getting rid of this garbage and ending up with the wanted answer. Physicist, David Bohm remarked that 'future science won't be based on conventional mathematics' - and mathematician, Kurt Godel, shared his opinion. Unfortunately, these two scientists didn't live long enough to realize that the great majority of modern physicists and mathematicians abandoned 'conventional' mathematics many decades ago. The late Prof. S. J. Prokhovnik remarked: "There are plenty of self-consistent mathematical systems which have scant relevance to physical phenomena and observations." I think Prokhovnik's statement needs some clarification. That is, there certainly are mathematical systems which have little or no relevance to physical events - generally, they are those pertaining to pure mathematics. But fortunately for the progress of science and technology, there are many mathematical systems which have great relevance to all branches of practical science. Here I am referring to the importance of using applied mathematics in the fields mentioned above. In other words, applied mathematics (unlike pure mathematics) is applicable to physical reality, not abstractions.

Mathematics is a man-made concept just like, for example, the 'mind' and 'time'. We humans can exist without mathematics, but mathematics cannot exist without us. The Big Bang, black holes, space-time, time dilation, curved space*,* the uncertainty principle, the expanding universe, and other theories of Modern Physics can be expressed mathematically; but no amount of mathematical formulae - can prove their physical existence. This goal can only be achieved by rational thinking and the scientific methods used long time ago by Galileo, Newton, Kepler, and other true scientists! In a nutshell, using mathematics without observation and experimentation is certainly not the way to discover scientific truths and facts! Of course, by skilfully manipulation of formulae, pure mathematics can be made (to "prove" almost anything! Actually, modern physicists have always been more interested in 'disproving' than 'proving'. That is, they have set-out to demolish the whole fabric of Classic Physics, not because it was wrong, but because it left no room for any kind of deity in it. And most people need to believe in a deity for self-protection and a soul for self-preservation - no matter how absurd their beliefs may be. For example, the main implication of the Big Bang Theory*: '*creation from nothing'*,* has to be one of the most irrational, absurd, illogical, unscientific, and nonsensical concept ever concocted by the human brain! Other absurd concepts (such as, for example, 'time dilation') can be expressed in mathematical terms, but 'creation from nothing' cannot. This is because 0 + 0 is equal to 0; and this is true both here on Earth and everywhere else in the universe, and no mathematical formulae or philosophical disquisitions can alter this fact!

Since the 1960s, most cosmologists, - with the full support of authorities - have proclaimed that they have abandoned the experimental method and instead derive new laws from mathematical reasoning. As English mathematician George Field said: "I believe the best method is to start with exact theories, like Einstein's and derive results from them." As far as I am concerned, they certainly derived some kind of results, but not the kind real scientists would agree with! Apparently, Einstein was well aware that mathematics and physical reality are often two different things, and that mathematics can be manipulated to appear to verify almost any claim. Unfortunately for the cause of scientific truth, it isn't only mathematical propositions that can be manipulated, but practical experiments as well. Sceptics and critics are often reminded by academic physicists that both the Quantum and Relativity theories have been validated by practical experimentation. Apart from the dubious nature of these so-called practical proofs, experiments (and the "confirmatory" mathematical equations) can be specifically designed in order to obtain a required result! Galileo and Newton, for example, made scientific discoveries, and explained them with mathematics, whereas the proponents of Modern Physics have been manipulating existing mathematical formulae to suit their theories. Figuratively speaking, 'pure' mathematical formulae are like clothes, as they can be made to fit. In conclusion, mathematics describes the relationship observed in nature; and it is not an 'underlying reality' as in Platonism and today's modern cosmology. Be that as it may, if - for any practical reason it isn't possible to carry out any observation and/or experimentation – 'applied' mathematics can become very useful. For example, I worked out a mathematical formula that shows how faster a certain receding galaxy travels away from our planet. More about this topic will be said on the pages ahead.

The Pre-Socratic Philosophers

There was in ancient Greece a short period of time (from the 7th century to the beginning of the 4th century B.C.) when wisdom, reason, true morality, and genuine scientific spirit prevailed. This was the Golden Era of the pre-Socratic 'natural philosophers'. As it happened, by the 6th century B.C., many Greek philosophers had achieved a degree of 'enlightened rationalism' which has never been matched since! To be precise, the true pre-Socratics were called *physikoi* - a Greek word which means 'natural philosophers'. In fact, they were more 'men of science' than philosophers. The attitude of the pre-Socratics was mainly genuinely scientific, as well as imaginative, vigorous, and adventurous. Also, they asked scientific questions and gave scientific answers, not religious or philosophical ones. Some of the pre-Socratic natural philosophers were: Thales of Miletus, Anaximander, Leucippus, Anaxagoras, Anaximenes of Miletus, Parmenides, Heraclitus, Democritus, Xenophanes, Diogenes of Apollonia, Empedocles, and Protagoras. Of course, not all pro-Socratic philosophers were completely rational. Pythagoras, for example, made a valuable contribution to the development of mathematics and astronomy, but his mathematical symbolism and mysticism, combined with his faith in the transmigration of the soul, can hardly be called rational and/or scientific. As for Heraclitus, the mysterious presentation of some of his views earned him the name of 'The Obscure'. Be that as it may, when considering the primitive times Thales, Anaxagoras, Democritus, Heraclitus, Anaximander, and other pre-Socratics lived in, most of them were intellectual giants! They had neither the wealth of scientific information, nor today's sophisticated technology; but - apart from their high intelligence - they possessed something very important - something that has been in very short supply for the past twenty-three centuries: superior reasoning power, enlightened rationalism, and a strong will to find out, not to believe. More importantly - unlike the great majority of post-Socratic philosophers, they didn't get fettered by any religious or mythological belief. A big difference between the pre-Socratics and the philosophical idealists is that the former did not pose the problem of the purpose and designation of the individual, of the relation of thought to being, and confined themselves to the study of nature, the Universe, and objective reality as it is apparent to the senses.

Here are the names and a few biographic notes of some of those great rational thinkers of ancient Greece:

Thales of Miletus (c. 624-547 B.C.) was the first historically known Greek natural philosopher and the founder of the Milesian School. Like other pre-Socratics, he was more a man of science than a philosopher. Thales made an exact prediction of full solar eclipses of 585 B.C. To him was also ascribed the calculation of the time of solstices and equinoxes, the discovered of the annual movement of the Sun. Thales shared with Pythagoras the fame of the founder of mathematics; his theorem is one of the fundamental theorems of geometry, and is frequently used. Thales was one of the Seven Wise men of Greece. He is also said to have travelled in Egypt, and to have brought geometry to the Greeks.

Heraclitus of Ephesus (c. 544 – 483 B.C.) Heraclitus' cosmological views are presented in a nutshell in his statement: "*This world which is the same for all, no one of gods or men has made; but it was ever, is now, and ever shall be an eternally living fire with measures kindling and measures going out."* He maintained that 'fire is the prime material in nature, and that everything is in continuous flux. Since everything is constantly changing and been renewed, one cannot step into the same river twice, because the second time one steps in new water.' *"The eternal world process is divided in circles or periods buy universal conflagrations, during which the world is destroyed and then brought into being again. The length of which periods is 180,000 years."* (Is this a rough description of a cosmic Big Bang?) According to Diogenes Laertius, Heraclitus' compiled a book which was divided into discourses: one on the 'Universe', another on 'politics', and the third on 'theology'. Apparently, we still possess 126 fragments of his work.

Anaxagoras (500-428 B.C.). This great thinker invented a naturalistic theory of the cosmos which was correct. "*The Universe is infinite, populated by a host of different worlds - many of them inhabited. There is no difference between the heavens and the Earth, no finite Earth surrounded by an unknowable heaven. Instead, all operate by the same principle that can be seen in everyday life, in the workings of nature and technology. Because the cosmos evolves and changes, it can never have a start in time, a creation from nothing - since such events are never known to occur. Instead it is unlimited in space and time, for there are no limits to what can be observed and learned."*

Democritus of Abdera (c. 460 – 370 B.C.) - disciple of Leucippus (c. 500-440) - was a founder of atomism and the brightest exponent of materialism in antiquity. ***"****The atoms, being indivisible particles of matter, are immutable, eternal, indestructible, and in continuous motion, differing only in shape, size, position, and order. They do not have any other properties, such a sound, colour, taste, etc., and exist conditionally, not by the nature of things themselves. A combination of atoms produces bodies, while their dissolution brings about the end of bodies. An infinite multitude of atoms is eternally in motion in infinite vacuum, which is divisible and atomised." "The more any indivisible body exceeds, the heavier it is." "There is an infinite multitude of worlds, born and dying, created not by any god, but rising and being destroyed of necessity in a natural way." "There is neither up nor down in the infinite void."* Democritus identified necessity and denied chance, which he considered the outcome of ignorance. The point of view of the atomists in particular, was remarkably similar to that of modern science - apart from Relativity and Quantum Physics -

of course. The atomist asked the mechanistic question, and gave a mechanistic answer. Their successors, until the Renaissances, were more interested in the teleological question - thus leading science astray. Democritus' materialism was continued by Epicurus and Lucretius.

Anaximander of Miletus (c. 610-546 B.C.) - Greek materialist philosopher, pupil of Thales. He was the author of the first philosophical work in Greece - *On Natura.* He was said to have invented a sundial with upright rod, drawn up the first geographical map of the Greek world, and given a systematic account of geometrical knowledge. He also held that the physical Universe came from something unlimited, rather than one particular kind of matter. He put the Earth in the middle of the Universe. "*The worlds are innumerable, yet it is no clear from the surviving evidence if they replace one another in their eternal rotation or existing simultaneously."* According to Anaximander, the Earth was originally covered with water, which it gradually evaporated and that which remained in low places on the Earth surface formed the seas. The first living creatures arose from the moist element (the sea) and were covered with thorny scales. When they grew older, they began to come ashore, and eventually gave rise to land animals and men. Historically, he was the first to propound the idea of evolution. Anaximander was full of scientific curiosities; wherever he was original, he was quite scientific.

Epicurus, Lucretius Carus, and Aristarchus of Samos

Although not pre-Socratics (and one of them was Roman not Greek) there existed in antiquity at least three 'philosophers' who, for various reasons have earned themselves a niche in the pantheons of rational thought: Epicurus, Aristarchus of Samos, and Lucretius Carus.

Epicurus (341-270 B. C.) - Materialist philosopher. From a chronological point of view, Epicurus didn't qualify as a pre-Socratic, but his teachings certainly did! He wrote over 300 books. He was a materialist philosopher and atheist who revived the atomism of Leucippus and Democritus, and added his own changes. He also introduced the idea of spontaneous (internally conditioned) 'deviation' of atoms from their courses in order to explain the possibility of collision between atoms moving in empty space with equal speed. Epicurus' universal principles are as follows: *"Nothing comes from nothing, and nothing returns to nothing. "* (Here is the First Law of Thermodynamics). *"The Universe has always been and will always be the same as it is now, because nothing else exists into which it could change." "The Universe is infinite both in the extent of void and the number of its components - compounds and atoms. The number of the worlds is also innumerable."* "*The Universe consists of bodies and void; the existence of bodies is confirmed by the evidence of the senses, and the existence of void is inferred from their motion." "Bodies are either compounds or the components of compounds, i.e. indivisible and unchangeable particles (atoms)." "Divine Providence,* wrote Epicurus*, "is nothing else than a crude invention of the crowd ."*

Epicurus saw the ultimate purpose of philosophy, not as a search for the hidden truth of things, but as a contribution to human happiness. He was a proponent of truth, reason, equality and social justice, and scientific rationalism. According to reliable sources, Epicurus was a very friendly, simple, and modest man. He used to provided cakes and water for his guests - a little wine and cheese on festivals - which included, against Athenian customs, women and slaves! Incidentally, the Athenian type of democracy (under Solon) was a sham, as it didn't include women, slaves, peasants, and paid workers! As in the case of other philosophers, whose ideas did not meet with the approval of religious and secular rulers, Epicurus' teachings have often been ignored, distorted, and/or slandered. He maintained that the purpose of knowledge and philosophy should be to free humankind from ignorance, superstition, and the fear of death which have always been (and still are) the sources of their belief in this or that invented god.

Aristarchus Of Samos (310 - 230 B.C.), was another great ancient Greek astronomer and mathematician, who chronologically didn't qualify as a pre-Socratic. He presented the first known heliocentric model that placed the Sun at the centre of the known Universe with the Earth revolving around it in circles once per year, while rotating around its axis once every 24 hours. Aristarchus' model included the large planets which also revolved around the Sun in circles and rotated around their axis at different speeds. The only surviving work of Aristarchus is called *On the Sizes and Distances of the Sun and the Moon,* but and it contains no hint of the heliocentric model. In fact, it adheres to the geocentric view. There are a few reasons for his decision, but the most probable one is that he decided that presenting a view in contradiction to the general consensus would have been unwise. Aristarchus' original book that contained his heliocentric model is lost ('destroyed') but fortunately, his theories on the Universe have been pieced together from later works and references. One of the most important and clear is the one mentioned by Archimedes in his book *The Sand Reckoner.* This scientific work bear witness to the fact that Aristarchus did indeed wrote a heliocentric model of the Solar System. In this work, by means of careful geometrical analysis based on the size of the Earth's shadow on the Moon during a lunar eclipse, Aristarchus concluded that the Sun must be much larger than the Earth. It is possible that the idea that tiny objects ought to orbit large ones and not the other way around, motivated his revolutionary ideas. Aristarchus also suspected that the stars we see in the night sky are actually nothing more than distant suns.

Titus, Lucretius, Carus (c. 99-55 B.C.) wasn't even Greek, but a Roman poet and materialist philosopher who made an important step forward in the development of Epicurus' doctrine. But because his ideas and ethics were similar to those of Epicurus and most of the Greek pre-Socratics philosophers mentioned above, I think he should be included in this section of this essay. One thing is for sure - unlike Plato, Socrates, Aristotle, and most other Western idealist philosophers up to the present time - Lucretius was a materialist and staunch atheist. He had the 'will to find out', as opposed to 'the will to believe'. He was a scientifically-minded and very clever man, who treated physics as an entirely independent object of philosophical enquiry; and most importantly, he aimed at developing a truly rational and scientific conception of the world which had very little to do with 'philosophical rationalism' - a trend which leads to religion, not science.

As far as the universe is concerned, Lucretius wrote:
"The universe as such has always existed and was not the product of a cosmic mind."

"*The universe was not only infinite but eternal in time."*

"Nothing can ever be created by divine power out of nothing."

"The universe as it is now, however, was created, but it was created by natural causes, and from the basic atoms. Out of this 'fortuitous' concourse of atoms came the Earth, the Sun, the Moon, the planets, and the stars."

As for religion in general, Lucretius wrote:
"*Religion is a disease born of fear, and a source of misery to the human race."*

Like Epicurus, Lucretius presented a very realistic picture of the world and of the nature of humankind. He was also a great force behind whatever degree of enlightenment and progress was achieved by the Roman world. His great poetical work *The Rerum Natura,* (On the Nature of Things) played a very important part in the development of the materialist philosophy of the Renaissance. However, unlike Epicurus, whose theory of physics was intended to provide the foundation for his ethics, Lucretius treated Physics in an entirely independent object of philosophical enquiry, and aimed at developing a rational conception of the world. For example, he viewed the problems of his atomism in the light of the biological conception of matter and scientific rationalism.

When taking into consideration that Thales, Anaxagoras, Heraclitus, Democritus, Anaximander, Epicurus, Aristarchus, and Lucretius Carus lived when science and technology were still in their infancy, their great intelligence, high reasoning power, and scientific outlook can be best appreciated. The truth is that by the 6th century B.C., the pre-Socratics natural philosophers (men of science would be a more realistic label), had achieved a degree of scientific rationalism which has never been matched since. Furthermore, their high morality and intellectual integrity was widely known!

PART TWO

Did Einstein Invent Relativity?

As soon as we mention the word *'relativity'*, German theoretical physicist Albert Einstein (1879 - 1955) springs to mind. In fact, the name 'Einstein' and the word 'relativity' have become synonymous. However, I think very few people are aware that what has been known worldwide as 'Einstein's Relativity' is based on the works of mathematicians and theoretical physicists who lived before and during his time. Contrary to what people around the world has been lead to believe for the past twelve decades, Einstein neither invented relativity nor most of the other theories for which he has been, and still is now credited for. He deserves scientific credit, but mostly for refining the scientific ideas of others, as well as coordinating them. Although Einstein 'borrowed' some mathematical formulae and scientific theories from other mathematicians and theoretical physicists, there is no record that he ever gave credit to them - not even to his first wife Marie Maric (herself a physicist) who worked with him on relativity.

Below is a list of the various mathematicians, physicists, and/or theoretical physicists who, from about the last twenty-five years of the Nineteenth Century played an important role in various field of Modern Physics, before and concurrent with Einstein's time. One thing these gentlemen had in common is that they all contributed (although to different degrees) to the demise of Classical physics. Of course, this list isn't complete but, for the purpose of this essay, it should suffice.

Elwin Bruno Christoffel (1829-1900) was a German mathematician and physicist. He introduced fundamental concepts of differential geometry, opening the way for the development of 'tensor calculus', which would later provide the mathematical basis for General Relativity. Christoffel is mainly remembered for his seminal contributions to differential geometry. In a famous 1869 paper on the equivalence problem for differential forms in *(n)* variables, published in *Crelle's Journal*, he introduced the fundamental technique later called 'covariant differentiation' and used it to define the 'Riemann–Christoffel tensor' - the most common method used to express the curvature of Riemannian manifolds. In the same paper he introduced the Christoffel symbols, which express the components of the Levi-Civita connection with respect to a system of local coordinates. Christoffel's ideas were generalized and further developed by Gregorio Ricci-Curbastro and his student Tullio Levi-Civita, who turned them into the concept of tensors and the absolute differential calculus. The absolute differential calculus, later named 'tensor calculus', forms the mathematical basis of the General Theory of Relativity.

It is hardly ever mentioned, but Einstein elaborated this theory on the mathematical work 'tensor algebra' of Christofell and the two previously mentioned Italian mathematicians: **Gregorio Ricci-Curbastro** (1853 - 1925) and **Tullio Levi-Civita** (1873 - 1941). Einstein was particular fond of the latter. In fact, when he was once asked what he liked the most about Italy, he answered: "Spaghetti and Tullio Levi-Civita*."* This Italian mathematician actually urged Einstein to explore the use of **'**curvature tensors**'** to create a 'gravitational theory', lately called the General Theory of Relativity. Einstein did just that, and found the tensor calculus very useful for the mathematical development of his theories. But this calculus was more than just 'very useful'. That is, although almost totally ignored (in Anglo-Saxons books and other mathematical and scientific sources), Ricci-Curbastro and Levi-Civita's studies on the 'absolute differential calculus with coordinates' have been a fundamental reference and the base of the mathematical structure of General Relativity. Unlike the infinitesimal calculus, the 'tensor calculus' allows physical equations to be presented independently from the choice of the coordinate system.

Roberto Marcolongo (1862 –1943) was an Italian mathematician, known for his research in vector calculus and theoretical physics. He worked on vector calculus together with Cesare Burali-Forti, which was then known as the 'Italian notation'. In 1906 he wrote an early work which used the 'four-dimensional formalism' to account for relativistic invariance under 'Lorentz transformations'. In 1921, Marcolongo, published one of the first treaties on Special and General Relativity, where he used the absolute differential calculus without coordinates, as opposed to the absolute differential calculus with coordinates of Tullio Levi-Civita and Gregorio Ricci-Curbastro. For the sake of accuracy, these two scientists made use of the 'Christoffel Symbols' in some of their mathematical work. The Christoffel symbols find frequent use in the theory of General Relativity, where space-time is represented by a curved 4-dimensional Lorentz manifold with a Levi-Civita connection. The Einstein field equations - which determine the geometry of space-time in the presence of matter - contain the 'Ricci stensor'. Once the geometry is determined, the paths of particles and light beams are calculated by solving the geodesic equations in which the Christoffel symbols explicitly appear. In General Relativity, the Christoffel symbol plays the role of the gravitational force field with the corresponding 'gravitational potential' being the 'metric tensor'.

English mathematician, **William Kingdom Clifford** (1862 – 1879), was above all else a geometer. The discovery of 'non-Euclidean geometry' opened new possibilities in geometry in Clifford's era. The field of intrinsic differential geometry was born, with the concept of curvature broadly applied to space itself as well as to curved lines and surfaces. Clifford was very much impressed by Bernhard Riemann's 1854 essay *On the hypotheses which lie at the bases of geometry.*https://en.wikipedia.org/wiki/William_Kingdon_Clifford - cite_note-9 In 1870, he reported to the Cambridge Philosophical Society on the 'curved space' concepts of Riemann, and included speculation on the bending of space by gravity. Clifford's translation of Riemann's paper was published in *Nature* in 1873. His report at Cambridge, On the Space-Theory of Matter, was published in 1876, anticipating Albert Einstein's General Relativity by 40 years! Clifford elaborated 'elliptic space geometry' as a non-Euclidean metric space. Equidistant curves in elliptic space are now said to be Clifford parallels. He published papers on a range of topics including algebraic forms and projective geometry and the textbook *Elements of Dynamic*. Although Clifford never constructed a full theory of space-time and relativity, there are some remarkable observations he made in print that foreshadowed these modern concepts. In his book *Elements of Dynamic* (1878), he wrote an expression for a parametrized unit hyperbola, which was later used by other authors as a model for 'relativistic velocity'. The book continues with a chapter *On the bending of space*, the substance of *General Relativity*. In 1923 Hermann Weyl mentioned Clifford as one of those who, like Bernhard Riemann, anticipated the geometric ideas of Relativity. In 1960, John Archibald Wheeler (1911 – 2008) introduced his geometro-dynamics formulation of General Relativity by crediting Clifford as the initiator. In 1970 Cornelius Lanczos summarized Clifford's relativistic premonitions this way: *"*Many of Clifford's were later realized by Einstein's Gravitational Theory.*"* Some later mathematicians came to the conclusion that 'it was Clifford, not Riemann, who anticipated some of the conceptual ideas of General Relativity'.

Be that as it may, German mathematician **George F. B. Reimann** (1826 - 1866) was the inventor of one of the most important works in geometry. The subject founded by this work is 'Riemannian geometry'. Riemann found the correct way to extend into (*n*) dimensions the differential geometry of surfaces, which the great German mathematician Karl Friedrich Gauss (1777-1855), proved in his *theorema egregium*. The fundamental object is called the 'Riemann curvature tensor'. For the surface case, this can be reduced to a number (scalar), positive, negative or zero; the non-zero and constant cases being models of the known 'non-Euclidean' geometries. It was **Marcell Grossmann** (1878 – 1936) who emphasized the importance of a non-Euclidean geometry called 'Riemannian geometry**'** (also elliptic geometry) to Einstein, which was a necessary step in the development of the General Theory of Relativity. Dutch-born American Physicist Abraham Pais (1918-2000), suggested that Grossmann mentored Einstein in 'tensor' theory as well. Grossmann introduced Einstein to the absolute differential calculus, started by Christoffel and fully developed by Ricci-Curbastro and Levi-Civita. Grossmann facilitated Einstein's unique synthesis of mathematical and theoretical physics in what is still today considered the most elegant and powerful theory of gravity: the General Theory of Relativity. The collaboration of Einstein and Grossmann led to a ground-breaking paper: *Outline of a Generalized Theory of Relativity and of a Theory of Gravitation,* which was published in 1913 and was one of the two fundamental papers which established Einstein's theory of gravity. (As it is the case with some of the other mathematicians and theoretical physicists mentioned above, Einstein did not created the 'theory of gravity' by himself, but he rather refined and co-ordinated it, as he did with almost all other relativity theories.)

Like his friend and colleague Gregorio Ricci-Curbastro, **Luigi Bianchi** (1865-1928) studied at the Scuola Normale Superiore in Pisa. He was greatly influenced by the geometrical ideas of Bernhard Riemann. Through the 0influence of Luther P. Eisenhart and Abraham Haskel Taub, Bianchi's classification later came to play an important role in the development of the Theory of General Relativity. In 1902, Bianchi rediscovered what are now called the 'Bianchi identities for the Riemann tensor', which play an even more important role in General Relativity. (They are essential for understanding the Einstein field equation.) According to Tullio Levi-Civita, these identities had first been discovered by Ricci in about 1889, but Ricci apparently forgot all about the matter, which led to Bianchi's rediscovery.

David Hilbert (1862-1943) **is known as one of the** greatest mathematicians of the 19th and early 20th century. His first work was about the 'invariant theory' which led the way to the proof of the renowned 'finiteness theorem'. Also, his famous '23 problems' were the most effective and profoundly deliberated set of problems ever presented by a mathematician. In 1920 Hilbert launched what became to be known as 'Hilbert's Program' which was based on principles that made mathematics a more logical based subject rather than tasks determined by randomly postulated rules. This great mathematician did a lot of work for mathematics in various branches of the subject such as invariants, functional analysis, algebraic number fields and the calculus of variations. His work in the branch of integral equations in 1909, was the basis of the research carried out in the 20th century in functional analysis. It also laid the foundation for his own work on infinite dimensional space known now as Hilbert's Space; a notion which is used in quantum mechanics. Although Einstein was (and still is) credited with finding the Field Equations of Gravitation - which gave the correct field equations for General Relativity - **Hilbert** published them in an article shortly before Einstein did. This resulted in an accusation of plagiarism against this scientist, and suggestions that the field equations should be called 'Einstein-Hilbert Field Equations'. However, Hilbert never pressed his claim for priority.

James Clerk Maxwell (1831-1879) was a Scottish scientist in the field of mathematical physics. His most notable achievement was to formulate the 'classical theory of electromagnetic radiation', bringing together for the first time electricity, magnetism, and light as different manifestations of the same phenomenon. Maxwell's equations for electromagnetism have been called the 'second great unification in physics' after the first one realized by Isaac Newton. With the publication of *A Dynamical Theory of the Electromagnetic Field* in 1865, Maxwell demonstrated that electric and magnetic fields travel through space as waves moving at the speed of light. Maxwell proposed that light is an undulation in the same medium that is the cause of electric and magnetic phenomena. The unification of light and electrical phenomena led to the prediction of the existence of radio waves. His discoveries helped usher in the era of Modern Physics, laying the foundation for such fields as Special Relativity and Quantum Mechanics. Many physicists regard Maxwell as the 19th-century scientist having the greatest influence on 20th-century theoretical physics. His contributions to science are considered by many to be of the same magnitude as those of Isaac Newton and Galileo Galilei.

George Francis FitzGerald (1851-1901) was an Irish professor of 'natural and experimental philosophy'. (i.e., physics). FitzGerald is better known for his conjecture in his short letter to the editor of Science titled *The Ether and the Earth's Atmosphere* (1889) that if all moving objects were foreshortened in the direction of their motion, it would account for the curious null-results of the Michelson–Morley experiment. FitzGerald based this idea in part on the way electromagnetic forces were known to be affected by motion. In particular, FitzGerald used some equations that had been derived a short time before by his friend the electrical engineer Oliver Heaviside. The Dutch physicist Hendrik Lorentz hit on a very similar idea in 1892 and developed it more fully into Lorentz transformations, in connection with his theory of electrons. In 1883, following from Maxwell's equations, FitzGerald was the first to suggest a device for producing rapidly oscillating electric currents to generate electromagnetic waves, a phenomenon which was first shown to exist experimentally by the German physicist Heinrich Hertz in 1888. The Lorentz–FitzGerald contraction (or FitzGerald–Lorentz contraction) hypothesis became an essential part of the Special Theory of Relativity, as Albert Einstein published it in 1905. He demonstrated the kinematic nature of this effect, by deriving it from the 'principle of relativity' and the 'constancy of the speed of light'. Along with Oliver Lodge, Oliver Heaviside and Heinrich Hertz, FitzGerald was a leading figure among the group of 'Maxwellians' who revised, extended, clarified, and confirmed James Clerk Maxwell's mathematical theories of the electromagnetic field during the late 1870s and the 1880s.

Hendrik Antoon Lorentz (1853-1928) was a Dutch physicist whose experimental and theoretical work was honored with the Nobel prize in physics in 1902. Lorentz' name is now associated with the 'Lorentz-Lorenz formula', the 'Lorentz force', the 'Lorentzian distribution', and the 'Lorentz transformation'. Lorentz' main articles are: *Lorentz ether theory, History of special relativity, History of Lorentz transformations - Lorentz 1,* and *History of Lorentz transformations - Lorentz 2.* In 1892 and 1895, Lorentz worked on describing electromagnetic phenomena (the propagation of light) in reference to frames that move relative to the postulated 'luminiferous aether'. He discovered that the transition from one to another reference frame could be simplified by using a new time variable that he called 'local time' and which depended on universal time and the location under consideration. Although Lorentz did not give a detailed interpretation of the physical significance of local time, with it, he could explain the aberration of light and the result of the Fizeau experiment. In 1900 and 1904, Henri Poincaré called local time Lorentz's 'most ingenious idea' and illustrated it by showing that clocks in moving frames are synchronized by exchanging light signals that are assumed to travel at the same speed against and with the motion of the frame. In 1892, with the attempt to explain the Michelson-Morley experiment, Lorentz also proposed that moving bodies contract in the direction of motion (see length contraction; George FitzGerald had already arrived at this conclusion in 1889).

In 1899 and again in 1904, Lorentz added 'time dilation' to his transformations and published what Poincaré in 1905 named 'Lorentz transformations'. It was apparently unknown to Lorentz that Joseph Larmor had used identical transformations to describe orbiting electrons in 1897. Larmor's and Lorentz's equations look somewhat dissimilar, but they are algebraically equivalent to those presented by Poincaré and Einstein in 1905. Lorentz's 1904 paper includes the covariant formulation of electrodynamics, in which electrodynamics phenomena in different reference frames are described by identical equations with well-defined transformation properties. The paper clearly recognizes the significance of this formulation, namely that the outcomes of electrodynamics experiments do not depend on the relative motion of the reference frame. The 1904 paper includes a detailed discussion of the increase of the inertial mass of rapidly moving objects in a useless attempt to make momentum look exactly like Newtonian momentum; it was also an attempt to explain the length contraction as the accumulation of 'stuff' onto mass making it slow and contract. In 1905, Einstein would use many of the concepts, mathematical tools and results Lorentz discussed to write his famous paper entitled *On the Electrodynamics of Moving Bodies,* known today as the Theory of Special Relativity. Because Lorentz laid the fundamentals for the work by Einstein, this theory was originally more correctly called the Lorentz-Einstein Theory.

'The Lorentz Transformations' relate the space-time coordinates, which specify the position *x*, *y*, *z* and time *t* of an event, relative to a particular inertial frame of reference (the "rest system"), and the coordinates of the same event relative to another coordinate system moving in the positive *x*-direction at a constant speed *v*, relative to the rest system. It was devised as a theoretical transformation which makes the velocity of light invariant between different inertial frames. The coordinates of the event in this "moving system" are denoted *x*′, *y*′, *z*′ and *t*′. The rest system was sometimes identified with the aluminiferous aether, the postulated medium for the propagation of light, and the moving system was commonly identified with the earth as it moved through this medium. Early approximations of the transformation were published by Voigt (1887) and Lorentz (1895). They were completed by Larmor (1897, 1900) and Lorentz (1899, 1904) and were brought into their modern form by Poincaré (1905), who gave this formula the name of Lorentz. Another version referring to the Lorentz Transformation still states that it was invented by Voigt in 1887, adopted by H. Lorentz in 1904, and introduced by H. Poincare' in 1906. According to some sources, Einstein picked it up directly from Voigt. Whatever really happened, it wasn't certainly Einstein or any other person alone who invented Special Relativity. Be that as it may, without the following two basic equations there wouldn't have been any such a theory:

$\boldsymbol{\beta = \sqrt{1 - (v^2/c^2)}}$ *(Lorentz Factor)*

and $\gamma = 1/\sqrt{[1 - (v/c)^2]}$ *(Lorentz Transformation)*

where (**v**) is the speed of the moving body and (c**)** is the speed of light

Albert A. Michelson (1852-1931), American physicist. In 1881 he tried to measure the relative motion of the Earth and aether, as it was expected in Fresnel's theory, by using an interferometer. He could not determine any relative motion, so he interpreted the result as a confirmation of the thesis of Anglo-Irish physicist and mathematician **Sir George Gabriel Stokes** (1819-1903). However, in 1886 Lorentz showed Michelson's calculations were wrong and that he overestimated the accuracy of the measurements. This, together with the large margin of error, made the result of Michelson's experiment inconclusive. Following the work of British mathematicians and physician Thomas Young (1773-1829), and French civil engineer Augustine-Jean Fresnel (1788-1827), it was believed that light propagates as a transverse within a medium called 'luminiferous aether'. To check this belief again, Michelson and **Edward W. Morley** (1832-1923), performed a repetition of the experiment in 1886. Fresnel's dragging coefficient was confirmed very exactly on that occasion, and Michelson was now of the opinion that Fresnel's stationary aether theory was correct. To clarify the situation, in 1887 Michelson and Morley repeated Michelson's 1881-experiment, and they substantially increased the accuracy of the measurement. However, this now famous Michelson–Morley experiment again yielded a negative result, i.e., no motion of the apparatus through the aether was detected (although the Earth's velocity is 60 km/s different in the northern winter than summer). So the physicists were confronted with two seemingly contradictory experiments: the 1886-experiment as an apparent confirmation of Fresnel's stationary aether, and the 1887-experiment as an apparent confirmation of Stokes' completely dragged aether. A possible solution to the problem was shown by Voigt, in 1887 and FitzGerald, two years later.

In 1887, German physicist **Woldemar Voigt (**1850-1919**)** formulated a form of the Lorentz Transformation between a frame of reference at rest and a moving frame with speed (V) in the (X) direction. Voigt's 1887 paper *On Doppler's Principle* is a very remarkable work. It is remarkable because it contains several original and fundamental ideas of Modern Physics. Hermann Minkowski said in 1908 that the transformations, which play the main role in the 'principle of relativity', were first examined by Voigt. Also, in 1909, Hendrik Lorentz said he could have taken these transformations into his theory of electrodynamics, if only had known them, rather than developing his own. In 1887, Voigt investigated the Doppler effect for waves propagating in an incompressible elastic medium, and deduced transformation relations that left the wave equation in free space unchanged, and explained the negative result of the Michelson–Morley experiment. The Voigt-transformations include the Lorentz factor $\mathbf{1/\sqrt{1 - V^2/C^2}}$ for the y- and z-coordinates, and a new time variable $t' = t - vx/c^2$ which later was called 'local time'. However, Voigt's work was completely ignored by his contemporaries.

Jules Henri Poincare' (1854-1912) was a French mathematician - who in 1905 -1906, was the very first to clearly formulate the Special Theory of Relativity, according to which space and time were connected. Subsequently, his ideas were developed by other scientists - notably, Joseph Larmor, and later on, Albert Einstein. The former published the *Lorentz Transformations* in 1897, some two years earlier than Lorentz, and eight years before Einstein. However, Einstein soon realized that the Lorentz mathematical equations could be used to explain physical phenomena as well, and promptly included them in his version of Special Relativity. Some people have been claimed that Poincare' and Lorentz are the true founders of Special Relatively. U.S. mathematician, Roger Schlafly for example, cites the 2005 book *Henri Poincare' and Relatively*, by Russian physicist A.A. Luganov, complains about how Einstein's acolytes have repeatedly over-praised Einstein while over-looking Poincare's great contribution to both Special and General Relativity. British philosopher, logician, mathematician, and Nobler Laureate, Earl Bertrand Russell, called Poincare' 'the greatest man that France ever produced.'

Sir Joseph Larmor (1857-1942) was a physicist and a mathematician. He proposed that the 'aether' could be represented as a homogeneous fluid medium which was perfectly incompressible and elastic. Larmor believed the aether was separate from matter. He united Lord Kelvin's model of spinning gyrostats (see Vortex theory of the atom) with this theory. Larmor held that matter consisted of particles moving in the aether. Larmor believed the source of electric charge was a 'particle' (which as early as 1894 he was referring to as the electron). Larmor held that the flow of charged particles constitutes the current of conduction (but was not part of the atom). Larmor calculated the rate of energy radiation from an accelerating electron and explained the 'splitting of the spectral lines in a magnetic field by the oscillation of electrons'. Parallel to the development of Lorentz ether theory, Larmor published an approximation to the 'Lorentz Transformations' in the *Philosophical Transactions of the Royal Society* in 1897, some two years before Hendrik

Lorentz (1899, 1904) and eight years before Einstein (1905). Larmor, however, did not possess the correct velocity transformations, which include the addition of velocities law, which were later discovered by Henri Poincaré. Larmor predicted as early as 1897 the phenomenon of time dilation, at least for orbiting electrons, by writing "... individual electrons describe corresponding parts of their orbits in times shorter for the [rest] system in the ratio **$(1- V^2/C^2)$½".** He also verified that the FitzGerald–Lorentz contraction (length contraction) should occur for bodies whose atoms were held together by electromagnetic forces. In his book *Aether and Matter* (1900), he again presented the 'Lorentz Transformations', 'time dilation' and length contraction (treating these as dynamic rather than kinematic effects). Larmor was opposed to the space-time interpretation of the Lorentz transformation in Special Relativity because he continued to believe in an absolute aether. He was also critical of the curvature of space of General Relativity, to the extent that he claimed that an absolute time was essential to astronomy (Larmor 1924, 1927).

Olinto De Pretto (1857-1921) was an industrialist, geologist, and a rather clever amateur astronomer from Vicenza. In 1903, he published the equation **$E=mc^2$** in the scientific magazine, *Atte*. There have been many claims that he was the first person to discover the famous 'energy-mass equivalence', generally attributed to Einstein. Allegedly, Einstein used De Pretto's discovery in a major paper published in his name in 1905. According to Professor Umberto Bartocci of the University of Perugia, De Pretto was never acclaimed, for his important discovery. "He did not discover relativity but there is no doubt that he was the first to use the equation," said Prof Bartocci, who has written an entire book on the subject. Apparently, this amateur astronomer had stumbled on the equation, while speculating about the existence of the medium called *aether* that was once supposed to fill all space and to support the propagation of electromagnetic waves. De Pretto's equation was published again in 1904 by Veneto's Royal Science Institute, but its great significance was not understood. "As it happened, a Swiss-Italian named Michele Besso alerted Einstein to the discovery, who in 1905 published it as his own work,'' said Prof Bartocci. It took years for his breakthrough to be grasped. When finally it did, De Pretto's contribution was overlooked while Einstein went on to become the century's most famous scientist.

Planck, Max Karl Ernst Ludwig (1858-1947), German physicist - the originator of Quantum Theory. In 1900, Planck solved the problem of 'black –body radiation' by assuming that the radiation was emitted in discrete amount (quanta) known as 'photons'. The Energy (*E)* of a photon is related to the frequency (*f)* of the radiation by the equation $E = hf$, where *(h)* is known as *Planck's Constant* - which has the value 6.626^{-33} Js. For his work he received the Nobel Prize in 1918. Planck's theory was used by Einstein to explain the photoelectric effect - and in 1913 by Niels Bohr to explain the spectrum of hydrogen.

Max Born (1882 – 1970) was a German-Jewish physicist and mathematician who was instrumental in the development of quantum mechanics. He also made contributions to solid-state physics and optics and supervised the work of a number of notable physicists in the 1920s and 1930s. Born won the 1954 Nobel Prize in Physics for his "fundamental research in quantum mechanics, especially in the statistical interpretation of the wave function". Born entered the University of Göttingen in 1904, where he met the three renowned mathematicians Felix Klein, David Hilbert, and Hermann Minkowski.

Niels Henrik David Bohr (1885 – 1962) was a Danish physicist who made foundational contributions to understanding atomic structure and Quantum Theory for which he received the Nobel Prize in Physics in 1922. He was also a promoter of scientific research. Bohr developed the 'Bohr model of the atom', in which he proposed that energy levels of electrons are discrete and that the electrons revolve in stable orbits around the atomic nucleus but can jump from one energy level (or orbit) to another.

The above list shows many of the mathematicians and theoretical physicists who contributed to Relativity and Quantum Theory. Here are a few more names: Paul Langevin; Max Von Laue, Walter Kaufmann, Max Abraham, Hermann Minkowski, Felix Klein, Karl Schwarzschild, Wilhelm Wien, and Sir Arthur Stanley Eddington.

Apart from physicist and mathematician Joseph Larmor (mentioned above) but who eventually rejected the tenets of Relativity, all the others were staunch relativists and proponent of Quantum Theory. The truth is that no mathematician and/or theoretical physicist should have called any of the theories of Modern Physics his/her own, because they consisted of the many results and empirical findings obtained by Albert Michelson, James Maxwell, Hendrik Lorentz, Woldemar Voigt, Henri Poincare', Albert Einstein, Max Plancks, Hermann Minkowski, and others. Incidentally, I listed all the above men of science, not because I agree with any of them, but simply to show that the concepts and axioms of Modern Physics have generally been invented by various mathematicians and theoretical physicists, supported by proponents of philosophical idealism and theism. In conclusion, in view of all the above, I think the title-question *Did Einstein Invent Relativity* should be answered with an emphatic No! Einstein was a very good mathematician but not a multiple genius like, for example, Leonardo Da Vinci - who was an outstanding painter and sculptor, as well as an inventor, engineer, botanist, mathematician, writer, etc. - and neither were the other scientists who contributed to the invention of Relativity and Quantum theories.

Einstein's Doubts

In a letter to Einstein, physicist Max Born wrote: "When average people try to get hold of the laws of nature, by thinking alone, the result is pure rubbish." This is not surprising, as most physicists assume that the members of the general public are incapable of logical reasoning, because they don't possess their superior education and intelligence - and that makes them stupid. This could be true in some cases, but my experience in life has convinced me that advanced colleges and universities are generally not the best places to learn rational and logical thinking. Proof of this fact is that many theoretical physicists and/or mathematicians believe the absurdities, impossibilities, and nonsense I named in the Introduction section of this essay.

In the early 1900s most physicists didn't accept Special Relativity. This is not surprising, as to the dismay of some of his colleagues, Einstein himself started having serious doubts about the veracity and physical value of this theory; also, he reached a time when he couldn't understand why so many people kept him and his work in such a high esteem. Here are a few examples which show how sometimes Einstein felt about mathematics, Special Relativity and Quantum Theory. Here I am saying 'sometimes' because of his inconsistency of opinion. Be that as it may, a good thing about Einstein is that (unlike his followers) he rejected his assumptions when their consequences failed to agree with observation. "That fellow Einstein," he commented ironically, at one point, "every year he retracts what he wrote the year before."

As I have already mentioned above, in an address to the Prussian Academy of Science in 1923, Einstein stated:

"As far as the propositions of mathematics refer to reality they are not certain; and as far as they are certain, they do not refer to reality."

"Special Relativity has no practical validity. It is purely a mathematical concept that will never take place in the physical universe."

"Mathematics and physical reality are often two different things

"The Special Theory of Relativity and the 'law' of the constancy of light speed are nothing more than mathematical propositions."

"Quantum Physics is not the real thing after all."

"We can only conclude that the Special Theory Relativity cannot claim any unlimited validity."

In his 1905 article *On the Electrodynamics of Moving Bodies* Einstein wrote: "Light is always propagated in empty space with a definite velocity (c)." But 10 years later he declared:

"The principle of the constancy of vacuum speed of light requires modification."

"Two things are infinite: the Universe and human stupidity; and I am not sure about the Universe."

This last quotation is an indication that Einstein wasn't even sure whether the Universe is infinite or finite. This despite the fact that, from a philosophical and religious point of view, both Relativity and Quantum theories reject the infinite model of the universe! I am wondering how many other tenets of Modern Physics did Einstein doubt or disagree with! Be that as it may, it shouldn't be hard to understand why some of his colleagues didn't like his deviations from orthodox physics. In fact, Einstein's closest friend, Max Abraham, criticized him in a very unfriendly manner!

I for one think that there are more concepts in Relativity and Quantum theories which Einstein wasn't quite sure about their validity both mathematically and as physical realities. But obviously, he didn't wish to upset some other of his academic friends - not to mention losing universal fame and riches by recanting his relativistic views of the Universe. This is exactly what Irish physicist and mathematician, Joseph Larmor, did when he rejected both the 'curvature of space' and the whole Special Relativity Theory - as was shown in the previous section of this work.

Unfortunately for the sake of scientific truth, Einstein's 'recantation' of some main tenets of Modern Physics have been totally ignored and/or suppressed by the great majority of international theoretical physicists and cosmologists, who have based their professional reputation on the Black Hole concept, the Big Bang Theory, Special Relativity, and Quantum Physics. And there is no doubt that they will continue to do all that is humanly possible to protect their personal interests, by putting them well before scientific truth! There is no doubt that Carl Sagan was referring to this reprehensible behaviour, so common in the halls of orthodox science, when he wrote: *"The suppression of uncomfortable ideas may be common in religion and politics, but it is not the path to knowledge: it has no place in the endeavour of science."* A logical explanation for this is that 'others', having realized the potential for fame and fortune engendered by Einstein's relativity, started introducing their own ideas to it. Some people have been blaming Einstein for much of the science fictional nonsense found particularly in Special Relativity and Quantum theory, but I think it is those who latched on to these theories who actually added, and have fanatically retained, many of the irrational and illogical related ideas of Modern Physics. And, unfortunately for the advance of true science, they have been doing so for many decades, thus making a mockery of rational and scientific thinking and common sense. I think that if even half of the time and resources wasted on trying to prove the Big Bang and other modern theories of physics, had been used on an impartial and truly scientific research, most of these theories would have been abandoned many decades ago! In fact, in his book *Fiction Stranger Than Truth,* relativity expert N. Rudakov wrote: "Our assessment and criticism of Einstein's arguments has been expressed throughout this work whenever necessary. It should be clear to the reader that, in our opinion, the theory has no positive value and should be discarded."

RECEDING GALAXIES AND THE SPEED OF LIGHT

About two years ago, I read an article in the Internet which stated that the universe expands at about 70 kilometres per second per mega-parsec. That is that a galaxy 1 mega-parsec away from the Earth is receding at about 70 km/sec—a galaxy 2 mega-parsec from Earth is receding at about 140 kilometres, and so on. Apparently, the members beyond the Local Group of galaxies (about 40) are receding from us, or more exactly, the distance between clusters of galaxies is constantly increasing, or so we are told. But, if this is the case —when, for example, a galaxy has receded for 14 mega-parsec away from Earth—its travelling speed has increased to 573,440 kilometres per second! This is a huge problem, as explained below with the help of the primary formula I invented. The derivative formulae are also shown just out of interest.

Primary Formula

$$S = (y \, . \, x^{z}) / x$$

Derivative Formulae

$$y = S /(0.5 \, . \, x^{z})$$

$$x = (y \, . \, x^{z}) / S$$

$$x^{z} = (S / y) \, . \, x$$

N.B. : These formulae are *Copyrighted*

S	Indicates the galaxy's recession speed in km/sec.
X	Stands for 2
Y	Stands for 70
z	Is the distance from Earth, in mega-parsec, reached by the receding galaxy

Table of recession of galaxies in Km/sec. up to 15 mega-parsecs

(*)	**(**)**	**(*)**	**(**)**
1	70	10	35,840
2	140	11	71,680
3	280	12	143,360
4	560	13	286, 720 *(near the speed of light)*
5	1,120	14	573,440 *(above the speed of light)*
6	2,240	15	1,146,880
7 -	4,480		
8 -	8,960	(*)	mega-parsecs from Earth
9 -	17,920	(**)	various speeds of galaxy in Km/sec. per mega-parsec.

Testing Question:

At what speed in km/sec is a galaxy ***travelling*** when it reaches
the distance of 14 mega-parsecs from Earth?

Formula $(y \, . \, x^{z}) / x$ should give us the correct answer to this question.

Final calculation: $(70 \, . \, 2^{14}) / 2$ **(70 . 16,384) /2 114,6880 /2 = 573,440**

Answer: 573,440 kilometres per second.

The above calculations have proved that by the time a receding galaxy has reached the distance of 14 mega-parsecs from Earth, it is travelling at the speed of **573,440** kilometres per second! This is a problem, because Special Relativity states that ‘no body can travel as fast as, or faster then, the speed of light, which is 299,792 kilometres per second. In fact, Einstein’s Special Theory of Relativity—with its postulate that ‘the speed of light in space is consistent and insuperable—is the linchpin that holds the whole range of modern physics together. However, to the dismay of all other relativists, Einstein himself doubted the veracity and validity of Special Relativity, which he called a “purely mathematical concept that will never take place in the physical universe”. Be that as it may, I suppose this theory has some mathematical value. However, as my formula has been proven to be correct, there are only two answers to this problem: a) what I read about receding galaxies was a hoax; or   b) *Special Relativity* requires some serious modifications!

Updating on the Internet article about the Receding galaxies; Although the said article is still there, the mathematical data it provided has been deleted. This doesn’t surprise me, as it questions the dogma of the insuperability of the speed of light.

(TO BE CONTINUED)