PHILOSOPHY OF EVERYTHING + PHYSICS OF EVERYTHING:

THEORY OF EVERYTHING

FINAL PART 3

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Key words: Philosophy of Existence, Entropy, Gravity, Mass, Einstein's Unified Field Theory, Higgs Mechanism, Weak Interaction, Relativity/Quantum Theory

PART I: VIXRA (1605.0239); PART 2: VIXRA (1709.0071)

SUMMARY

Members of the public and intellectuals do appreciate that the universe appears to be something beyond explanations. It is a colossal miracle, because there is no evidence of any kind, capable of indicating how such an impossible reality could have arisen, without attributing it to super-intelligent induction, based on nothing like the science and physics we know of. We should not use the limitation of human knowhow, to claim that it all of existence arose from nothing, or from a few grams of vacuum energy, based on science which did not exist. This third article is the last, before the author publishes his Theory of Everything, in his coming book, later this year, 2018. Elaborating a genuine Theory of Everything (TOE) is obviously a very demanding proposition. To start with, you can never be certain it has been correctly formulated, because we are just humans, created without the capacity to possess supernatural knowledge. The TOE remains the only universal unified concept having a future, after Glashow two years back openly admitted that the Grand Unified Theory of his and Georgi, of 1974, was dead. To start with, the TOE should be an all-encompassing model that provides answers to many questions from scientists and the public about the origin and nature of our universe. Historically, the seeds of a theory of our universe were sown in efforts to produce a field unification theory, in 1864, when Maxwell published his dynamical theory of electromagnetic field. This influenced Einstein in 1905 to use Maxwell's constancy of the speed of light to unify space and time into the concept of spacetime. Later Einstein conceived of curved four-dimensional spacetime to describe gravity in his General Relativity. Some years later Weyl in 1919 came up with the gauge electromagnetic field theory, which eventually led to the concept of Grand Unified Theory, which was believed to be one in which all forces would merge into a single force, due to different fields being able to "merge" into a unified one.

Kaluza in 1921 envisaged General Relativity as a 5-dimensional entity in which Klein, in 1926, suggested that the fourth dimension could be curled up to illustrate gravitational force. These varied developments were the earliest attempts at trying to understand the universe in unified field theories, and it was in this rather confused context, as from 1930, that Einstein embarked on an ambitious journey into a 25 year-dedication to formulate a classical Unified Field Theory, which never materialised, and he was still scribbling some equations on his last day in 1955. A decade later, there started a new realisation about unifying the electromagnetic force with the Weak Interaction, arising from the work of Higgs, Glashow, Weinberg and Salam that produced the unified Electroweak Theory, the unification of the electromagnetic and weak forces. This trend encouraged physicists to contemplate that perhaps at very high energies, not yet possible under contemporary technologies, all forces might unify into one grand unified theory, the GUT, which when unified with gravity, would produce a theory of everything. Recent data suggest that a Grand Unified Theory is either a theoretical curiosity, misunderstood, or a mirage. Speculations went much further, for there have been suggestions that a GUT, championed by Salam and others, would produce at the highest energy a single combined field of all forces, from which would emerge evidence of the occurrence of superparticles, for each of the standard particles in today's physics. The important questions are why the universe requires such physical entities and how do they fit into the final explanations of the realities of our laws of nature, for instance the nature of consciousness and other phenomena of existence, like Darwin's theory of evolution or black holes or the Big Bang theory, or even about the origin of our universe.

This being so, several efforts, in the physics and cosmology domains, try to dig into the strata of universal knowledge to search for our ultimate relevance and future, but the topic of finding a TOE was seen to be even more elusive. However, scientists were convinced that the Theory of Everything was first and foremost a concept of our ultimate realities and of existence. It is believed it would harbour major components of physics in intimacy with philosophy. You need philosophical inspiration to see the physics, which then tells you how the philosophy should be like, or you need to see the philosophy to understand why the physics is as it is. The physics is pure physics and the philosophy pure philosophy, but they might both be imperative towards understanding the origin and the meaning of existence.

What we have currently is a collection of narratives about the origin of our universe, all spinning around contrasting centres of philosophical influence. Even here in intellectual work, there is an implication of entropy for once the culture of defining various theories of everything has reached a certain maximum, the true Theory of Everything could find a greater likelihood to emerge. In

entropy, including intellectual entropy, there will be factors of determinism and indeterminism, such that they would interplay in the process of the evolution of ideas, where entropy would ensure we always move from maximum order, with loads of data, to maximum disorder, in framed concepts on which little more conceptual work is possible, a fact which means that the Theory of Everything, describing the most evolved universal tenets of existence, would represent the most disorderly intellectual system, at the highest intellectual entropy. That would be the universal explanatory key conceived by humans for humans, based on philosophy and physics, to unlock the mysteries of the universe that was masterminded by a Supernatural Power.

INTRODUCTION

Intellectually and philosophically, our current decade is at a critical cosmological conjecture. Nine decades back, Reverend Lemaitre's Big Bang (1927, 1931) idea followed up on Einstein's general relativity (1916), and the gist of it was the cosmological sensation that the universe could have had a divine designer, based on the scientific fact that it came into existence at a specific time in the distant past. That was in stark contrast to the general notion in that period that the universe could have eternally existed, as believed since millennia by the Greek philosophers. Lemaitre's vision of how our universe came into existence at a certain moment in time, billions of years back, indicated a universe that must have been metaphysically engineered. Some nine decades later, despite huge advances in relativity, quantum theory, particles research and the laws of physics, we still have no clear idea how the universe came to be. It is widely believed that a Theory of Everything, although science does not know what its basic parameters are and what it is fundamentally, could hold the scientific formula which enabled our universe to arise from whatever quantum precursors there could have existed. Admittedly, this prospect is a dramatically tough one to elucidate. Contemporary physicists sometimes suggest that there could have occurred vacuum fluctuations or related physics from which our universe spontaneously arose, from nothing really. It is the author's objective to address this huge enigma, based mainly on quantum theory and Einstein's relativity, in a Theory of Everything, which will be published by the end of 2018. It is firmly expected this TOE will have resounding scientific, philosophical and social tremors, for it is the author's earnest belief that its repercussions would impact on science and universal human welfare.

Interestingly, Lemaitre's scientific support of the supernatural origin of existence came in between the two world wars, (1927;1931), published in French and English respectively, and it did progressively produce a big impact, particularly in the post WW2 period, when it was in competition with Hoyle's Steady State concept (Hoyle, 1948; Bondi, Gold, 1948), which promoted

a non-divine natural universe. Currently in our present era, we happen to be living a period buoyant with threats of WW3, in a socioeconomically contracted world, saturated with electronic mass communication at the speed of light, and with a cosmology that promotes ideas about the materialistic nature of our universe. A pertinent reflection is to imagine what would be the public impact of the scientific validation of the supernatural origin of our existence, in our current era. Could it rally humanity towards greater peaceful coexistence through international efforts to making our world increasingly a place of profound respect for everything that has been divinely created: the environment, life and existence? Only the future will tell. The author's publications (Peerally, 2008, 2009, 2013, 2018, 2017a, 2017b) and his next book try, philosophically, to bring out that proof, of the scientific supernatural origin of our universe, highlights the potential of global human spiritual cohesion, if atheists accept that there is an impersonal Supernatural Mind behind creation, while theists would look upon as the origin of the universe as design by a personal Mind or God.

Strangely, theological concepts about the divine origin of existence now compete with several natural (accidental) theories of our ultimate origin that many can see are basically falsifiable. Most humans would think that the universe is a supernatural creation, and so do most Nobel Laureates. However, to understand existence, potentially, can become a matter of despair and incomprehension, philosophically: The reality is that nobody knows what kind of existence we are, which is why Charles Taylor (2007), our brilliant modern philosopher, has come up with the beautiful concept that, generally, our intellectual focus should be to *"understand"* our realities, rather than trying hard to understanding God. As we know, Taylor's focus is on secularism, its nature and future, but his approach of analysis was focussed on "*understanding"* all relevant parameters scientifically, an intellectual concept of universal value. Uncertainty in cosmological knowledge is coinciding with disparage ideas about the nature of our universe, to which have been added parallel, bouncing, infinite universes, all arising naturally from nothing at all. Chinese physicists (Qing-yu Cai et al, 2014) have been telling us in recent years how the Big Bang must have popped up from absolutely nothing, based entirely on mathematical equations. Not surprisingly, this kind of science, in the beginning of the 21st century, creates confusion about important philosophical and spiritual issues facing the meaning of existence. If the whole of humanity were to be told that scientifically our universe is simply an accident of nature, how do we know that certain Machiavellian minds would not exploit the absence of divine wrath to plunge the world more and more into chaos and strife, because it profits them to do so? The only scenario that humans would welcome is to see philosophy and science discovering evidence of the supernatural dimension of existence, and perhaps to look for proof of this scientific view, as

Hameroff and Chopra (2012) have tried to show, by searching for evidence there might well be a spiritual perpetuation of our metaphysical existence in an afterlife. This is implied in Hameroff and Penrose's model of consciousness, where it is suggested that consciousness resides in microtubules and that it could turn into a soul as an afterlife phenomenon. According to Penrose and Hameroff (2014), our experience of consciousness is the consequence of quantum gravity effects inside the brain cell microtubules, which they call "*orchestrated objective reduction"* (Orch-OR). This concept could help science to get nearer to explaining not only consciousness but perhaps even the idea of the soul, which could be an afterlife eternal phenomenon. However, quantum gravity is a very vague concept and my TOE will attempt to say what it might be. The soul is likely to be far more complicated than quantum gravity, for it is squarely a metaphysical phenomenon.

Building the philosophical foundation about our realities of existence started millennia back in history, which can be gathered from the manner philosophers have reflected on the universe for ages. This kind of exercise benefited from the greatest minds of humanity, since at least over two millennia back in history, in the work of philosophers like Socrates, Aristotle, Plato, Al Kindi, Al Tusi, Al Haytham, Kepler, Newton, Descartes, Leibniz, Einstein, Planck, Lemaitre and others, until the middle of last century. Subsequently we saw additional impetus with the efforts of the more modern scientists/philosophers like Hoyle, Hawking, Penrose, Weinberg, Salam, Higgs, Glashow, Chalmers, Platinga, and Taylor among many contemporary scientists, in heroic attempts to reveal the extraordinary marvels of our universe.

This paper, the last in this series of articles (Peerally, 2016, 2017a) about the Theory of Everything in relation to philosophy, spirituality and science, argues that knowledge has now reached a peak, where humanity has the prospects of understanding the origin and meaning of existence. This series of papers is meant to prelude the author's books, of which the second and third of the initial planned trilogy will now be merged into a single volume to be published by end of 2018: *The Origin of Universe, the Theory of Everything and The God Theory.* The first book *"In Search of Consciousness and the Theory of Everything"* was published in 2017 (Peerally, 2017b), in several editions. It introduces the universe in a historical and general manner, combining science and philosophy in a comprehensive intellectual narrative, intended to eventually facilitate understanding the thinking behind the nature and creation of our universe. All combined, these two books focus on the Theory of Everything of our Universe, in an elaborate scheme that will try as far as possible, to explain the creation acts and their significance around existence.

Socioeconomic and political evolution has attained a critical conjuncture, where we will continue to immerse into international conflicts and even threats of the worst kind of nuclear world wars. The obvious approach to protect human destiny is to discover the finality of what is existence, and to chart existence along philosophical and spiritual lessons, based on science, conducive for peaceful co-existence. There is promising scientific potential in philosophical advances related to the meaning of existence and to understanding the how and why of our universe, that can accrue from a genuine Theory of Everything. With the Theory of Everything intellectually accessible to the great majority of humans, there will be enormous civilised opportunities to engage in matters of mutual interest, instead of futile religious conflicts and political and military confrontations. The recent papal plea, in January 2018, coming from Pope Francis, guarding humanity against threats of nuclear conflicts, is a damning message about our current appreciation of the meaning of existence. After all life is very temporary: a physical/spiritual existence that rarely goes beyond a century, a mere fraction in the eternity of time. Each generation exists, very temporarily in the universe, to ensure that future generations should be better off, not worse off, irrespective of creed. It is in the awareness of the final explanation of who and what we are and why, that holds the ultimate reasons and expectations of how we should view existence. Clearly philosophers and scientists have a huge responsibility of conveying the most appropriate signals, based on evidence, to steer human destiny towards the realisation that we have been created to live an extraordinary existence, which took a colossal level of supernatural intelligence, ingeniousness and of power and love to materialise: first as energy, followed by the three forces, consciousness, particles, symmetries in physics, then atoms and molecules, and finally to life and humans. Interestingly there begins to trickle circumstantial evidence (Hameroff and Chopra, 2012) there can be an afterlife, rather than just a total blank after our material existence.

PHILOSOPHY AND EXISTENCE

To start with, the final theory is likely to show that some of our physics concepts/models, listed at the end of this paper, would have to be revamped in attempts to move nearer towards understanding our realities of existence. Clearly, the explanations of nature start with understanding the laws of nature, the standard model of forces and particles, quantum theory and Einstein's relativity. The objective is to integrate them all into a final theory of everything, for that would be the only mechanism that can liberate science and philosophy from many of the mysteries of the how and why of existence. It is meaningful that the Theory of Everything should equate to the Philosophy of Everything combined with the Physics of Everything (Peerally, 2016). This means we cannot attain the final answers to the mystery of existence by ignoring what humanity

has learned since millions of years of her evolution: the philosophical history of humanity seems to show we must have been brought into existence by a mysterious Supernatural Mind. This occurred based on a scheme that combined materialism and spirituality, determinism and indeterminism. We realise that modern views about physics are the fruits of quite recent research, spanning perhaps a period of 12 to 13 decades, during which we have seen heroic efforts, particularly towards the elucidation of the science of forces and particles, and of mechanics at both the macro and micro levels. Often our scientific discoveries, particularly in physics, have been naturally overflowing into the domain of philosophy. Finding the ultimate answers about existence requires not only understanding the science of the universe, but also a profound philosophical approach towards analysing what we know about existence.

Research has produced a whole diversity of concepts which, except for the Big Bang, unfortunately have finally focussed on how hypothetical universes, zillions to infinite universes, could arise from practically nothing, in String and M theories, or from some hypothetical infinite vacuum fluctuations, which could be lying inert until catalysed into universes. Interestingly the Big Bang is looked upon as obviously implying a supernatural act of creation, while vacuum energy or string theory universes are natural creation of existence, occurring, mathematically, for no reasons at all. The implication between supernatural and natural universe is colossal: we are everything imaginable or nothing at all. The author's research papers and books attempt to show that we are in fact an extraordinary existence, created in the image of the supernatural power behind creation, otherwise the universe would be an absolute impossibility. This implies that our realities of existence harbour colossal knowledge, scientific, philosophical and metaphysical, that will continue to be the subject of research around the meaning of existence: Our science and philosophy are at a critical crossroads, in our current period of life. This possibility must have been lying in the waiting in the determinism/indeterminism complex behind our creation.

There is a consensus that an ultimate theory of everything can explain, in a lucid scientific and philosophical sense, everything about existence. There are, it is true, several reputed philosophers and scientists who believe such a concept could not exist. Its discovery, on planet earth and other habitable planets, could in fact be a cosmic phenomenon: it means finding perhaps the explanation of existence by reading into God's mind, then evolving a dramatic novel conceptual framework, to be refined and formalised as time moves forward. Einstein realised that such a quest was possible, because the universe to him was deterministic and comprehensible, having the potential through its naturalness to lead to its scientific elucidation. To sense the ultimate explanation, amongst the maze of existing natural parameters, an interesting idea of

Charles Taylor (2007) is that surely the problem of solving the meaning of existence is not about *"understanding God"* but about "*understanding*" nature and existence, point blank! The Theory of Everything is a scientifically, spiritually and morally essential knowledge in human existence, and the fact we have so far been unable to unravel it, is beginning to seriously compromise the human appreciation of the importance of our moral obligations with respect to existence, in all its aspects. That could be the reason why the whole world has become a stage of contention and discord, nationally and internationally: we should see in the current plight of humanity a very worrying trend: the reason is basically we are not capable of seeing the ultimate philosophical explanation of existence. There is a lingering sadness in the subconscious mind of most humans that we are the orphans of the universe, for the *subconscious mind yearns to know we are of supernatural origin*. The irony of our current extremely buoyant though chaotic period of existence is that it holds the secret to that deep-seated mystery of what we are, the discovery of which will be under scientific and philosophical studies for millennia, possibility with yet untold unpredictable scientific and intellectual advances.

It is easy to appreciate Ray Bradbury's traumatic vision of humanity as an impossible existence in an impossible universe (Peerally, 2017b). The ultimate nature of existence depends on the fateful interplay of a spiritual determinism with a probabilistic material indeterminism. The spiritual can be compared to Descartes' mind (Wilson, 2018). a kind of universal consciousness, the "*quintessence"* in Plato's fifth element of existence, while material indeterminism lies in the manner scientific and philosophical systems evolve, as if influenced by a kind of indeterminism within the property of consciousness, equivalent, figuratively, to the air, fire, earth and water of Plato's other four fundamental elements of nature. Indeterminism and determinism are fundamentally mutually inclusive concepts, in a sort of loose integration, and Bohr's indeterminism, most probably, is not the finality of the state of reality as often interpreted in the context of quantum theory, but rather a state within the complex of indeterminism/determinism, which naturally characterises the supernatural reality of the universe. Interestingly, Einstein visualised determinism in nature as the existence of a pantheistic Spinoza's mind throughout nature, an effective reasoning to marginalise the quantum indeterminism of Bohr. In the modern time of our current existence, this view of Einstein has been adopted by a few corpuscles of biologists under the concept of "*Intelligent Design",* which is a non-scientific, imaginary or at best a self-contradicting concept. Bohr's indeterminism has prevailed, scientifically, over Einstein's determinism.

Currently we must understand the mystical science of Bohr's Quantum Theory and about the deeper meanings of Einstein's relativity laws, such as for instance the meaning of mass and gravitation, and about how to relate science and philosophy to our realities of existence. I believe that our obstacles to rationalise existence in conjunction with science, philosophy and religion are not normal, and augur something mysterious about entropy and intellectual evolution. Our present difficulties, as Charles Taylor (2007) insinuates, is not about struggling to know God, but about understanding the meaning of existence although we have reached a very *high level of intellectual knowledge*, whether we like it or not. This may mean that possibly Einstein's relativity will be integrated with quantum theory as a development which will allow a deep comprehension of our universe and existence. Again, I emphasize the pivotal point made by Taylor: the problem is not about belief in religions and God, but about understanding the nature and meaning of existence. The universe fundamentally consists of a periodical delicate balance of determinism and indeterminism. We now possess all the basic knowledge that was predetermined at the time of creation. That is all here, in front of us. Belief in a Supernatural Mind as the designer of our existence does not require further comprehension spiritually, and it is very likely that science will prove there is a spiritual dimension, in due course. The year 2018 presages, since we are increasingly saturated with so many speculative ideas about the nature of our realities, that time is fast ticking impatiently. We know how messy environmentally, socially, politically, cosmologically and psychologically humanity has been, particularly in the last twelve decades, with two cruel world wars, destruction of human societies, that goes on unceasingly and of the degradation of the environment, in spite of huge intellectual advances, although we have always believed we were created to be a superior kind of intellect, cosmologically and spiritually on this planet of ours, in the image of God.

We seem to forget the importance of respect for the supernatural creation of a fabulous universe, as easily as we ignore the scientific knowledge that teaches us to be respectful of the natural habitats and of the extraordinary nature of creation and of the laws of nature. In this second decade of the 21st century, the world is experiencing political confusion, environmental degradation, human tragedies and social chaos, in many societies, sometimes attributed to the abusive scales of electronic transmission of not necessarily of the best information for human consumption. You only need to listen to the daily news to get an idea of how our world is. Clearly the technological and intellectual progress of mankind seems to be on a collision course with the spiritual, social and economic values taught by philosophy and theology, for billions of people across the continents. Let us speculate for a moment what World War 3 would mean for Planet Earth. The fact that references to World War 3 have been regularly in the news recently indicates

a bit of the current morale and condition of existence. Charles Taylor, a devout Christian, is so right: humanity needs to understand the fundamental meaning of existence, and to be spiritual. This is the kind of ultimate message which could accrue from the Theory of Everything, which normally implies understanding the universe and our realities. We need to release the enormous pressure building up in our knowledge gap about our own relevance in a universe that suddenly popped into existence 13.72 billion years back. The dire truth is that our human societies have experienced, by now, only a mere couple of centuries of modernity that has produced the critical mass of fundamental knowledge about our laws of nature. However, the knowledge gap in the waiting is about *understanding the ultimate meaning of the universe*. This does not lie within the ability of politics and religions: philosophy and science are parts and parcels of human destiny to effectively achieve this objective. It would be a terrible disaster for the world and humanity if we cannot understand the origin and meaning of our existence. Aristotle, in his Physics Book 1, realised more than two millennia back that *"all thinkers posit contraries as principles", "neither must one principle be composed of another principle", "nor should they be composed of other things, but the other things must be composed of them. Now the primary contraries possess both these attributes." They are not composed of other things because they are primaries."* (Hippocrates Apostle and Lloyd Gerson, 1982). In pure Philosophy, contraries are metaphysical principles, not mathematical, meaning there would be physical and spiritual nature in them, in addition to mathematical attributes.

The theory of everything has been on the agenda of intellectuals and philosophers since numerous millennia, for good reasons. It started initially, as far as we know, as comprehensive spiritual endeavours to win metaphysical control over human destiny, health and welfare. That kind of theory of everything, known as Shamanism, was practised in ancient societies, at least, as far back as 17 millennia as described in the archaeoastronomical studies of Rappengluck (2004,a, b), Lewis-Williams and Pearce (2005), and Scarre (2007). Similarly, a materialistic theory of everything, alchemy, which aimed at achieving the transmutation of metals, emerged when humans dodgily started to philosophically and scientifically understand/misunderstand the chemical and physical realities of our universe.

There is a significant record of speculations on what is a theory of everything in cosmology, physics and science. Einstein spent several decades of his life searching for a theory of everything that would integrate the electromagnetic field with gravitation, but it was premature in his period to achieve this ambition. Einstein was not alone to focus on unraveling a Unified Field Theory, an exercise which influenced several of the later generations of physicists. Physicists in recent

decades realised the scientific potential to merge the two giant laws of nature, quantum theory with Einstein's relativity, into a Theory of Everything, a vision which has so far proved difficult to realise.

Furthermore, there is some mysterious connection between the realities of the universe and the phenomenon of consciousness, and great thinkers like Plato, Aristotle, Kepler, Whewell, Descartes, Leibniz, Einstein, Hawking, Penrose, Chalmers and Platinga have sensed the connection, and it is perhaps likely that only a unique coincidence of thoughts can potentially take us to discover the basic aspects of our ultimate theory of consciousness and of existence. The Theory of Everything is likely to be, if it really is a convincing semblance of the supernatural final explanation of our realities, the master key of the how and why of existence. It is expected to reveal the scientific basis of the final explanations of our laws of nature but, more importantly, with gradual refinement, it would guide us, over the decades and centuries, even the millennia of our future existence, more and more towards our aspirations to fully understand existence, spiritually, philosophically, scientifically and technologically. We would realise that eminent thinkers like Emperor Aurelius and Plank were right in believing that everything that exists postulates consciousness. Sean Carroll surely makes a pertinent remark when he says we do not want to accept the strange features of the universe as brute facts. There is no reason why, as Einstein so vividly wished, we should not progressively see deep into God's mind, at the moment the universe big-banged into our being.

Interpretations of quantum physics which suggest that something can arise from nothing are basically philosophical speculations rather than science. That kind of reasoning was dealt with effectively, as long back as the mid decades of the last century. The world of cosmology was, in that post-relativity period, right in ensuring the demise of the Steady State Concept, which was based on the spontaneous creation of matter (Bondi and Gold, 1948; Hoyle, 1948; Hoyle, Burbidge, Narlikar, 1993), leading to the general acceptance of the Big Bang as the most plausible explanation of the manner of origin of our universe. Surprisingly, the origin of our universe, under the Big Bang concept, has been seen, by eminent physicists, as suggesting divine creation. This is a philosophical belief. When we say something sounds philosophical there is also a religious insinuation in the remark. We do not know what kind of universe we have: that situation creates a dynamic void between what is science, philosophy and religion, for our current appreciation of cosmology has made their lines of demarcation often fluid. However, it is possible that belief in the occurrence of a Supernatural Mind behind our existence is fundamentally necessary to successfully devise the ultimate or final physical concept of existence. This is because such a

theory could tell us something about the supernatural process that created existence: a science comprised of the ultimate philosophy which we call metaphysics. When we have the Theory of Everything, humanity will more easily see that the integration of philosophy, science and religion comprises the composite field of natural philosophy.

There are ideas of metaphysical logic and philosophy, in addition to scientific reasoning, which demand that our final laws of physics could only be explained if there was an initial super-intellect to, as Hawking said, blow over the cosmic initial, before the Big Bang launched itself, into the birth of our universe. The supernatural intervention, however, was not some kind of abstruse magic, as we humans understandably would imagine, but a deliberate metaphysical move, without which there would be no universe and ultimately, we humans, many billions of years later. We argue that the occurrence of a superpower to set the universe and existence moving is logical, philosophically and scientifically. The deliberate creation of matter and consciousness is the most important metaphysical reality of our universe, and it was the most fundamental physical reality that enabled the cosmological creation of our realities. Failure to appreciate this critical issue, by marginalising or negating a metaphysical Mind behind existence, is bound to lead to sterile controversy about whether science or philosophy is theistic, atheistic or agnostic. It is clear to most humans that the existence of the universe and the laws of nature requires a creative scientific/philosophical Supernatural Mind. The Mind behind the universe would be appreciated as God by theists and deists, or as an impersonal Supernatural Mind by many atheists. The Theory of Everything, as we can see, largely amounts to also knowing the metaphysics in Hawking's (Hawking, 1988) remark about the need for a Supernatural Mind, in a manner of speaking, to blow over the singularity, to conceive a metaphysical design which, subsequently, led to our universe.

IS THERE AN ETERNAL METAPHYSICAL CONSERVATION OF EXISTENCE?

Intellectual maturity progressively transited through spirituality, philosophy, natural philosophy to ultimately, in our current period since at least two centuries, constitute the domain of science. Philosophy, the earliest intellectual knowledge, based initially on spirituality, is a natural product of the instinctive consciousness of human existence. With the consolidation of studies on what our realities ought to be, philosophy naturally channelled humans to engage in various forms of mathematics. Historically, philosophy and mathematics are basically interrelated, which takes us to believe that before the universe came into existence, the Supernatural Design must have been a kind of metaphysics, which to us humans equates generally to philosophy and metaphysics, the supernatural knowledge that presumably would lead subsequently to our existence. Since it is

accepted we were created in the Creator's image, it was natural that in due course in ancient history, technological knowledge, based on philosophy and mathematics, would evolve in the ancient cultures, like the Sumerian, Babylonian, Egyptian, Aztec, Chinese, Hindu, Greek, Islamic and the European eras, and centuries later, this ancient intellectual heritage saw the emergence of theoretical and experimental scientific awareness as a more advanced intellectual domain, that subsequently evolved into natural philosophy, and later into the natural sciences. The evolution of intellectual pursuit has naturally been part of the phenomenon of entropy, in the supernatural creation scheme. Every phenomenon in the universe, follows the path of entropy. The earliest and profoundest account of cosmological entropy was George Lemaitre's Big Bang mechanism, when an unknown pure precursor transmuted into matter, forces, space time and energy, which set forth the reality of time and the beginning of existence.

An obvious meaning of existence is that it evolves with time, so that existence is a perpetual dynamic process. Entropy, including every aspect of the evolution of existence since the big bang, was likely guided by the reality of consciousness, whatever it is. The origin of forces, particles and of matter, started in a vestigial form to progressively assume increasingly sophisticated conditions producing our universe. Entropy ensures that all evolutionary dynamic states will eventually fizzle out, the beginning of the end of material existence. So, the end of the universe would ultimately consist of the last phases of progressively weakening waves and particles, throughout the astronomical expanse of increasing material emptiness, for trillions of years, until nothing *detectable*, theoretically, would exist at the ultimate lowest possible temperature of 0° Kelvin or Rankine, the final fate of material and mortal existence. From some initial metaphysical cosmic realities that produced our universe, we seem to realise that the ultimate condition of entropy will be just vanishing material emptiness. With such a picture of our universe and its fate, one cannot ignore the possibility that there could also be a kind of an Eternal Conservation of Existence, perhaps a spiritual version of our law of conservation of energy, possibly the perpetuation of some form of consciousness, or soul (Hameroff and Penrose, 2014), (Hameroff and Chopra, 2012) eternally. This would imply that all universes comprise an eternal supernatural plan of existence. There is something very abstract with this description of entropy and the progressive degeneration of the universe, whose ultimate outcome cannot be a total nothingness. One needs to reflect on this point: under the concept of a vanishing universe: it is not possible that there will finally be just nothingness. Therefore, under the concept of conservation of energy and of existence, there could be a reality into which a dying universe has to turn into, ultimately.

WHAT NEW KNOWLEDGE UNDERPINS OUR CURRENT SCIENCE AND PHILOSOPHY?

In contrast, the beginning of the Big Bang, with its enormous high-energy temperatures, was a unique and very complicated cosmological state which could not have violated the principle of energy conservation. An important impediment of nearly all origin of universe concepts is that they disconcertingly violate the law of conservation of energy. Humans generally believe that our universe must have had a divine origin, and the Big Bang provides some circumstantial support to this possibility. Scientists usually cannot make use of this argument point blank, for that would be unscientific. It is true, however, that many of our most eminent scientists and philosophers are adamant: there is no conflict between science and theology. Interestingly, more than two millennia back, Plato stated that the perceptible deity described in his Timaeus is visible to the human eye, as the reflection of the Cosmic Soul of the heavens (Latura, 2012). Consciousness is believed by some eminent physicists to be a universal phenomenon, although science has been unable to find its explanation.

The intellectual community realises that a quantum leap in new knowledge acquisition through the discovery of the Theory of Everything can make an important difference to the current basic laws of science of our universe. For instance, Einstein profoundly felt so when he arduously attempted to integrate electromagnetism with gravitation. We now firmly believe that integrating Einstein's relativity laws with quantum theory based on high energy physics can produce a theory of everything. There is the possibility as well that high energy physics and particles research will take us nearer towards the final explanations of the secrets of our universe, although these could possibly also lead to new scientific and technological perceptions. The feeling is that our technologies and concepts of science are approaching a ceiling, and we appear to be getting bogged down with the vision that machines would soon assume superhuman consciousness, when what we need is to rather explore what theoretical science and philosophy lie above the current knowledge ceiling. We have now reached a ceiling, based on the enormous research that started with Planck, Einstein, Dirac, Bohr, Heisenberg, Pauli, Schrodinger, Bohm, subsequently by the more modern physicists like Murray Gell-Mann, Weinberg, Salam, Glashow, Hawking, Penrose, and so many others. We are gradually reaching the end of that nostalgic epoch of great discoveries by some of humanity's greatest minds on which our modern world largely rests technologically. In the coming few decades we will begin to look ahead and there will probably emerge a post-modernity period of physics that possibly might take numerous centuries to explore, based on the progressive understanding of consciousness and quantum theory, and about what could lie ahead in metaphysics. A particularly puzzling futuristic hope is that interplanetary exploration might start to become an established reality. The human potential to progress runs into dozens of millions of years of possibility, provided we manage our present

heritage diligently, which is not the case in the present contemporary period, sadly so for it is a huge pity we are just beginning to really to taste the potential of modernity.

UNDERSTANDING OUR ULTIMATE REALITIES

To understand our ultimate nature does not demand a *lot more of traditional* scientific research discoveries, but a combination of new scientific and philosophical reasoning along, for instance, the same wavelength of reasoning, as that of Charles Taylor, a practicing Christian, as mentioned earlier, in his use of the term *"understanding".* I will illustrate this point about "*understanding",* in the remark which I reproduce below, from an article:

"*A 21st-century discourse on quantum mechanics and space–time*" by Tushna Commisariat, Nov 6, 2014, in *physicsworld*, about the lecture entitled: *"Quantum Mechanics and Spacetime in the 21st Century"* – by the eminent physicist Nima Arkani-Hamed, presented within Perimeter Institute's Public Lecture Series. My comment was as follows:

Nov 7, 2014 at 10:15 pm

"I listened to his live broadcast and was amazed at his great enthusiasm about a concept which is as he had said 'was not obviously wrong' which he feels is encouraging. The talk should have been about QM and Spacetime but we got a general talk about the possible critical importance of energy in spacetime, particularly at very high energies. Although he did not say so I got the impression he feels that a critical experimental study of particles at very high energies could reveal the ultimate secrets and additional string theory dimensions of the universe and feels that at the relatively low LHC energy supersymmetry might not reveal any of its secrets. That naturally led him later to add that he looked forward to colliders at much higher energies. So, governments and research councils will have to continue pumping huge funds into colliders in the future to test string theory and supersymmetry. In a way he has a similar view as Hawking that the universe started as a singularity of infinite energy, mass and curvature and now it has expanded significantly and that will continue. The present energy of spacetime is far too low to allow meaningful investigation of our ultimate realities and if we compress spacetime to a very small volume the energy will get very high and that would be revealing.
Well I do not think we can elucidate our ultimate physical realities through such studies. The P. Institute holds the view that our various physics concepts are on a collision course as they are diametrically opposed to one another. To me the problems of physics are first that there are some concepts which to me cannot be reflective of our realities. The infinitely small singularity of infinite energy in my opinion did not exist and our universe had an initial architectural design which made it possible to have quantum mechanics, relativity, matter, energy in a preconceived methodology.

Science can elucidate how that occurred. We need to get our laws and concepts right. For instance, there is this issue of the determinism view of Einstein as opposed to the indeterminism of QM, and the Einstein EPR and the Bohr/Einstein debates etc followed by Bell's Theorem. I believe that both Einstein and Bell are right and are not in contradiction and why because I believe that a deterministic period in the initial origin of the universe programmed the emergence of indeterminism in quantum mechanics. Without this combination of deterministic and indeterministic attributes there would not have been a universe with particles, atoms, molecules and consciousness and life. There are many other issues needing better interpretations and gradually we will know about the origin of our physical realities. In quantum mechanics, as Einstein and coauthors Podolsky and Rosen argued, there could exist hidden variables and therefore Quantum theory was incomplete. In my opinion hidden variables do exist but if they do they have no direct connection with superluminal speeds, for it is precisely this faster than light argument which creates confusion."

There is significant diversity of interpretations about our cosmological realities, particularly in relation to relativity and quantum theory. The Grand Unified Theory, or Grand Unification Theory tries to integrate the three forces, electromagnetic, weak and strong, while integrating the GUT with relativity and quantum theory could produce the Theory of Everything. This is a fair representation of the secrets behind the ultimate explanations of existence.

That is the reason why I am constantly reminded of Taylor's term "*understanding*", and its application in the context of our current appreciation of what is the universe and its realities. It means looking for the most likely context of the origin of our impossible universe, where there should have existed a reason and plan, and so, a Super-Architect that conceived the universe, with humans as part of the supernatural existence. So, the totality of existence is the eternal supernatural and us. The implication of the "*infinite regress*" reasoning, which some intellectuals find attractive when they wish to disprove the existence of a Supernatural Mind, implying the impossibility of infinitely searching for the *"final"* of the possible ultimate explanations of the origin of existence, which clearly makes no sense: how finite/infinite is infinite? Philosophically and scientifically, the universe clearly points to only two levels of existence: the material/philosophical existence in our universe, and the possibly eternal existence in the infinite, eternal, supernatural metaphysical dimension.

The concept we are implying here does involve complicated science and philosophy, over and above what we have from the scientific discoveries of the last twelve decades or so, supported by the views of our eminent philosophers, since millennia. However, once it has been formulated,

based on a precise "*understanding*" of the context, clearly, I hope, there is little chance it can be wrong, for there can be only one such concept, based on a critical appreciation of the most appropriate scientific and philosophical context: the choice will not be whether you believe there was a supernatural creator or not, for that would be too simplistic an argument, but whether there should have been a scientific/philosophical Mind that set the whole creation moving, in the first instance, based on a metaphysical strategy. Once formulated comprehensively, our Theory of Everything is likely to be accepted and improved upon with time, and it is very unlikely there could be another, which differs widely from it, scientifically and philosophically. There can exist only one real Theory of Everything, as the basic concept to telling humanity the why and how of the supernatural origin of our universe. Applying Taylor's concept of "understanding" with respect to the theory of everything of our universe, means basically that it is desirable to examine the criteria for a theory of everything which make sense in terms of how the TOE can explain our realities, in a set of scientific arguments, which are not directly linked to belief that a Supernatural Mind is responsible for the existence. The scheme of criteria will then be examined whether they could have naturally existed, or whether only a Super Intellect could have engineered them metaphysically.

Historically, our great minds have analysed the fabulous laws and theories around existence and nature, although, often, these are difficult to bind together into an overall integrated concept of our existence. In brief, the objective to conceive a TOE continues to remain enigmatic to our intellectual community. Philosophy, mathematics and science are not perfect; they are not all-encompassing adequately to produce the ultimate truth, point-blank. How can we see the ultimate realities of our universe in the absence of the critical creative role of the original supernatural designer, with the same perspicacity as Einstein developed his relativity concept, from which Georges Lemaitre saw how the Big Bang was supernaturally masterminded at the time the universe came into existence? Both Einstein and Lemaitre were looking into the mind of the architect of the universe. Einstein openly declared the mind behind creation to be an extraordinary phenomenon, of unimaginable beauty and knowledge.

MOVING TOWARDS THE TOE

What we have inherited from history is the teaching of our great minds like Aristotle, Plato, Al Kindi, Al Farabi, Al Haytham, Descartes, Leibniz, Darwin, Crick, Planck, Bohr, Dirac, Einstein, Weinberg, Salam, G. Ellis, Platinga, Chalmers, Taylor and of many others, and the experimental findings of major research facilities like: Tevatron, LHC, Hubble and Planck Telescopes and currently the numerous neutrino research facilities, like for instance Kamiokande Neutrino

Observatory. All considered, science and philosophical thoughts and concepts have matured significantly, particularly in the past few centuries, with some extraordinary theoretical and experimental developments in the last 12 decades.

Physicists seem to agree that the two most fundamental science concepts: quantum theory, the physical concept of the smallest realities of particles and forces, and Einstein's relativity which describes the macroscale of the universe, are automatically irreconcilable, unless the physics of classical general relativity discovers gravitational quantum realities, so far unknown to science. The major obstacle is the fact that Einstein's general relativity focuses on gravity to explain the coherence of matter and space time in the universe, from the largest structures to the level of the minutest like atoms and particles, but neither quantum theory nor general relativity can say what therefore could be the quantum realities of gravitational interaction, if really there is such a field as traditionally understood. Most probably the graviton does not exist. The long-sought integration of relativity with QT is very challenging but is believed to be necessary to produce dramatic new knowledge about the universe. Gravity is most probably not a real force and does not have a particulate nature. Behind the incomprehension around gravitation is the problem about "*understanding"* the context of how existence functions, simply. In a nutshell, unraveling the ultimate or final theory of our universe demands understanding the entire context of our laws of nature, as well as what is it that underpins quantum mechanics, and appreciating the context from which the spiritual and philosophical disposition of humanity had their roots. If we can see how the universe originated in a TOE, we might surely understand the fundamental physics of gravitation and of quantum theory, and what kind of physical reality to impart to gravity and mass.

An outstanding feature of creation is the fact that the basic building blocks of matter appear to be practically permanent realities. The truth that comes out since millennia of reflections about existence is that the universe is one conscious coherent whole, consisting of particles and energy, realities which are practically indestructible. Every aspect of existence seems to evolve, since its creation, along a predetermined pathway, broadly speaking, but in an indeterministic fashion in the details, meaning that once the foundation of our laws of physics, chemistry and of biology had been realised, the further evolutionary processes might not be the determinate creation of specific molecules and organisms. The most likely scenario of the Big Bang was the formation of the matter of the universe, which would ultimately lead to life and humans. This is clearly seen in the existence of forces, particles, atoms, molecules within our evolving realities, so extraordinarily appropriate for the progressive evolution of every phenomenon of our existence. That was possible to a significant extent, due to the combination of determinism and indeterminism, in

existence, which contradicts the philosophy of "*Intelligent Design",* or of pantheism that believes that nature is God and God is nature. The process of creation was one of supernatural master-minding that would lead to a habitable universe, with the most appropriate laws and realities of existence, and most possibly to an after-life. The fact of deliberate creation, leading to the most appropriate laws of nature and an extraordinary universe and existence, points to the existence of an after-life, for it does not make sense that the ultimate metaphysical reality could be an absolute nothingness.

The creation of our universe must have been a mechanism that underpins quantum theory, to a significant extent, and it is not surprising that Einstein, who was not impressed by quantum theory, seeing the perfection of nature, went to the extent of having some sympathy for Spinoza's pantheism, but Einstein did not cease to believe there was a lot more to science when he spent the last three decades of his life, unsuccessfully attempting to unite electromagnetism with gravitation. That ambition of Einstein was not a mistake under any reasoning, for that idea of his was the most beautiful that could exist in the scientific reality and culture of his period, and he was the kind of person that would have found a theory of everything before anybody else, if he were living in our present time. Gravitation and electromagnetism were the only laws of physics known then, in addition to quantum theory that was fast developing, but since the electromagnetic force and gravitation were the fundamental properties of every reality known in nature, he judged that the integration of electromagnetism with gravitation could be harbouring the ultimate explanation of the mystery of the work of a supernatural designer, behind the existence of our universe and its laws of physics. He was not wrong, but premature in his thoughts. My own Theory of Everything, to be published in my second book by the end of 2018, holds a comparable kind of reasoning as Einstein's, except that we have a lot more information on which to base a TOE in our current period, practically a century after Einstein's relativity research.

Einstein's firm belief there was a fundamental association of electromagnetism with gravitation, must be true. Interestingly, since physics has not so far united quantum theory and relativity, anti-gravitation and inflaton have been created as physical realities, in approaches that can be shown to be basically outside the realms of reality. This whole subject, it is true, is complicated and elusive. For instance, the incompatibility of QM with general relativity is often discussed in the context of the space time singularities of Hawking and Penrose (1970), and the nature of the centre of black holes. We, perhaps, may imagine that these two contexts are very much related, but the singularity idea is likely a lot quite unreal and unnecessary, but appear as temporary bodies in high energy physics. While black holes make cosmological sense, and do exist although

they are clearly difficult to circumscribe intellectually, singularities are theoretical ideas, and may not exist, except conceptually or exceptionally, about which not much more, in terms of hard physics, is realistically possible, except that they are made up of matter that is temporarily lumped. Except mathematically, there is no reason why the final fate of individual black holes should be a singularity. In fact, in the author's reflections it is not critical for black holes to turn into singularities. This aspect of quantum theory will be taken up by the author in his Theory of Everything, and the integration of QM with GR has some relationship with black holes and singularities.

EINSTEIN'S UNIFIED FIELD THEORY

Einstein, as early as 1905, realised the incompleteness of physics generally, especially regarding the physics of moving bodies, as presented in his special relativity paper*: "It is well known that Maxwell's electrodynamics---as usually understood now---when applied to moving bodies leads to asymmetries that do not seem inherent in the phenomena. Take, for example, the electrodynamic interaction between a magnet and a conductor."* More than a decade later Einstein said in his Nobel Lecture*: "We seek a mathematically unified field theory in which the gravitational field and the electromagnetic field are interpreted only as different components or manifestations of the same uniform field."* I personally find this view of gravity is difficult to analyse, for I am convinced that gravitation is a mysterious entity, and may not be related physically to the EMF. Subsequently he even said in 1918, about Planck: *"May he succeed in uniting quantum theory with electrodynamics and mechanics in a logical system."* If a Theory of Everything can explain the Origin of the Universe, then this means that quantum theory would have been united with electrodynamics and mechanics. Einstein's dreams of a unified field theory did not materialise, after devoting nearly three decades to this project , and even Glashow's Grand Unified Theory proved incapable of being supported in studies, over several years, aimed at detecting decay of protons at the Kamiokamonde. The most recent Kamiokamonde proton decay studies indicate that protons do not decay, so that unifying the three forces into a unified grand force will need to wait for further investigations.

ENTROPY AND TIME

Time is not a normal dimension, it is a physical reality intimately linked to physical dimensions and has no direction, although we know if moves forward. It had to be one of the major physical peculiarities to accompany the creation of our universe, for we were created as a temporary, time-bound material reality. The universe came into existence 13.72 billion years back and is slowly moving towards its total demise in some trillions of years. Therefore, there is in our existence an

arrow of time which becomes apparent because we perceive events moving in the direction of entropy, from less entropy, that is highly ordered systems, to increased disorder: From, for instance, a state of pure photons (very ordered systems) to a mixture of particles, then atoms, molecules and various bodies (more and more disordered systems), in other words towards a decline or degradation of ordered systems. An elegant way of viewing entropy is to visualise the circumstances around the origin of how any universe originates and evolves. At the earliest time of its origin, the universe was an incredible collection of pure energy (the most orderly or perfect system imaginable), and then particles were formed from a fraction of energy (that amounted to the start of disorder in the universe, meaning to a mixture of energy and particles, compared to a state of pure energy) (Peerally, 2013) . This stage was followed in due course in the appearance of atoms (increased entropy, that is even more disorder). So in the history of our universe, we initially had forces, then particles and atoms, molecules, matter, galaxies, nebulae, stars, solar systems, planets, life, to be followed progressively and eventually by the degeneration of stars, planets, and of galaxies towards the end of the universe, with just dusts in the distant future, ultimately weakening waves, until the demise of everything detectable, in trillions years, although, we cannot say that the ultimate transformation of the final products of entropy are just nothingness, for that would violate the law of conservation of energy. Entropy, or increasing disorder, accompanies the succession of events, which our brain interprets as time, so that time flows into the future, or more accurately, time appears to be irreversible. The sequence of events, is the arrow of time. Einstein found it mathematically convenient to integrate time with spacetime and the value of time is subject to differences depending on gravity and acceleration, meaning that events take longer or less time depending on acceleration to which we are subjected. Under the same circumstances, space, meaning distance as well, changes, and becomes contracted under the influence of gravity or acceleration, so that we live longer or less, depending on the velocity of our motion or the force of gravity acting on us. There should be no real mystery in understanding that time is a real factor of physical existence, and universes like ours had a creation moment, followed by their existence for a period to then progressively disintegrate to finally reach a state of practically nothing of any significance, to us humans. What was the nature of time before the creation of our universe is a mystery, but we can perhaps speculate that there must exist a supernatural version of time, although we cannot see that there is no entropy when time is infinite, in metaphysics.

The arrow of time and the law of conservation of energy are not mysteries of existence, and are physics issues requiring to being reflected upon, for there could be new ideas in terms of their mathematical/physical/material meaning or nature. In the case of the whether the arrow of time

obeys the principle of symmetry appears strange, although views have been expressed to suggest that it is violated in certain weak force decays, that kind of interpretation might not be final, but likely open to interpretations, depending on our appreciation of the nature of our physical realities. There could be issues of time open to interpretations with respect to the nature and explanations of what could be metaphysics, the domain which underpins quantum theory and relativity.

WEAK FORCE, HIGGS PHENOMENON AND MASS

The author's Theory of Everything intends to also focus on aspects of the Weak Force, the Higgs concept and on the meaning of mass. For this preliminary discussion, we must highlight there is a deep mystery regarding the meaning of mass, and how it relates to gravitation. Even if we agree there is a direct connection between mass and gravitation, there must exist a field to impart mass to the fermions. This view, realised by physicists in the period of Higgs, Englert, Brout and others in the sixties, was a profound achievement. However, if there is a Higgs Field, the question that needs further discussion, is how there could be a gluey Higgs boson, when such an effect of resistance to motion is a phenomenon belonging to gravitation. Gravitation is the only potential energy that exists universally, and its existence could be related to the occurrence of conservation of motion, at the universal scale, idea reminiscent Descartes' conservation of the quantity of motion. The energy content of the universe at the Big Bang will remain constant until the end of our universe due to the conservation of energy law, but also due to, as Descartes' universal law of the conservation of motion, that is tied intimately to gravitation: conservation of motion appears to mean that acceleration is unconditionally accompanied by a diametrically opposite centrifugal force, or gravitational pull, in the opposite direction.

The Weak Interaction also goes by the name Quantum Flavourdynamics, QFD. The Weak Force is believed to impart mass to fermions, and it has been theorised that is achieved through the Higgs field and boson. The Weak Interaction is fundamentally an interaction between elementary particles, where fermions exchange the force carriers: Z, W+ and W-, which are very massive bosons. The fact these bosons have large masses is due to the short range of the Weak Interaction, whose strength is several orders of magnitude inferior to the EMF and the strong nuclear force. Quarks, the fermions of the strong force, exist is six flavours, and the Weak Force is exceptional in getting quarks to swap their flavours. The Weak Interaction is a particularly surprising reality in its power to break symmetries: the Parity Symmetry and the Charge Parity Symmetry.

SYMMETRIES IN PHYSICAL REALITIES

The symmetry phenomenon reminds me of a memorable brief conversation at one of the World Academy of Science Conferences. I was with some other Fellows of the Academy around the dining table, with the plates and napkins having been neatly installed by the hotel boy. A short while before starting dinner, one senior Fellow, looking at the arrangement of the napkins was reminded of a physics symmetry analogy which used to be a favourite remark by Professor Abdus Salam, the founder of the Academy, who won the Nobel Prize for his work on the Weak Force, where symmetry issues are profoundly important. Salam's dinner table symmetry analogy, it was pointed out, was as follows: Looking at the round table before dinner, you can see the perfect symmetry in the arrangement of the napkins, plates, glasses etc. As you prepare yourself for dining, you notice the napkins on both your right and left. It makes no eventual symmetry inconvenience, whether the first person that picks up her napkin takes the right or left one. Once this is done the arrangement is fixed on either a clockwise direction of the use of napkins, or anticlockwise. As we can clearly see, it makes no difference to the dinner process, whether the choice of the napkins takes a clockwise or anticlockwise pattern: either of them is perfectly symmetrical. Likewise, physicists believe that the matter we have in our universe has symmetry phenomena: for example, a world of electrons around protons (matter) should not be different from a world of positrons around antiprotons (antimatter). While symmetry is practically a law in physics, its violations in quantum physics, is an exciting field of research.

This topic is one of the unsolved mysteries of physics due to certain phenomena, called *Charge* and *Parity*, CP, not behaving as expected, leading to symmetry violation, when most behave as expected. C refers to *Charge* symmetry: particle as opposed to antiparticle, e.g. electron is negatively charged, while positron is positively charged. So, under the CP concept of symmetry, positron and electron should behave perfectly faithfully if they were appropriately replaced in physical realities. For instance, proton (positive matter) and electron (negative matter) makes the hydrogen atom, a matter entity. Under the symmetry rule, antiproton (negative antimatter) and positron (positive antimatter) would yield an atom of antihydrogen (antimatter) that would be the chemical equivalent of the hydrogen (matter), in a world where atoms are made up of antiprotons and positrons. This antihydrogen antiatom has been produced experimentally, but difficult to store for it practically immediately gets annihilated by a hydrogen atom, which is found everywhere. The science of symmetry naturally led scientists to speculate about the possibility galaxies of antimatter could exist, while asymmetry studies with particles known as neutral K mesons or kaons seem to indicate this might not be the case. Studies (Christenson, Fitch, Cronin, Turlay,

1964) have shown there exists asymmetry of matter-antimatter in these particles, making the vision of universes of antimatter far less likely realistic.

P is Parity, meaning the mirror image context of particles that is exchanging right with left would make no difference in the physics of matter/antimatter, and should reproduce properties faithfully in the same fashion as the matter particles we know in our universe. What this means is, for instance, when you look at yourself in a mirror, your right in the mirror is the left of yourself as you are. If you were in a universe, where mirror images of everything we have exist, that should go unnoticed to life and existence. So, in the study of particles of matter and antimatter, like positron and electron, physicists have noticed no violation of charge and parity, and that applies to all particles studied, except neutrinos. It is so remarkable that the study of neutrinos has become a research strategy of top priority, to determine what they are and why they are so strange. However, the violations of symmetry by neutrinos need to be carefully appraised to ensure that every possible pertinent issue has been faithfully taken on board, for it is recognised that neutrinos are very mysterious and unpredictable.

Unanswered questions concern for instance why CP violations occur when you expect matter and antimatter to obey the same laws of nature. Symmetry is not violated when a transformation can be done without changing the laws of physics. CP violation has been viewed as very important in physics and its discovery in quantum physics has important impacts and can lead to Nobel award recognition. Neutrinos have impacted dramatically on the meaning of realities in the physics of particles because they are so abundant in the universe, to the extent that billions of them pass through every square inch of our body surface every second.

UNSOLVED PROBLEMS OF PHYSICS AND COSMOLOGY

It goes without saying that there are numerous aspects of physics and cosmology, and of the origin and nature of the universe and of the laws of nature, for which we have partial comprehension, or little or no explanations. A final Theory of Everything is possibly capable of judging which of our unsolved mysteries in physics and cosmology can be scientifically resolved, based on principles of new physics that could relate to them. Incompleteness may well apply to particles, and laws of physics and of cosmology. The list given below may not be final and may depend on personal appreciation of our realities of existence. Partially resolved issues, theories and laws are, among others, the following:

1. The Higgs phenomenon.
2. Time.

3. Nature of particles.
4. Nature of energy.
5. Nature of gravity.
6. Spacetime.
7. Mass.
8. Electromagnetic force.
9. Weak Force.
10. Quantum chromodynamics.
11. Antigravitation, dark matter and dark energy.
12. Accelerated expansion of our universe.
13. Cosmic inflation.
14. Inflaton.
15. Neutrinos.
16. Matter/antimatter asymmetry.
17. Symmetry and symmetry violations in physics.
18. The Standard Model of Forces and Particles.
19. Superluminal events.
20. Black holes, centre of black holes, and singularities.
21. Causality and the constancy of the speed of light.
22. General Relativity.
23. Special Relativity.
24. Quantum Theory.
25. Kinetic energy.
26. Potential energy.
27. Integration of GR and QT.
28. Integration of relativity concepts with GT.
29. Heisenberg Uncertainty Principle.
30. Second Law of Thermodynamics.
31. Entropy.
32. Consciousness.
33. Spooky action at a distance.
34. Non-locality.
35. Measurement problem.
36. Quantum decoherence.

37. Hidden variables.
38. Quantum entanglement.
39. Quantum fluctuations.
40. Vacuum energy.
41. Vacuum fluctuations.
42. Cosmological constant.
43. Quantum gravity.
44. Graviton.
45. Zero-point energy.
46. Origin of the universe, infinite universes, parallel universes, megaverse.
47. Extra dimensions.
48. Supersymmetry.
49. Unobservable fundamental forces.
50. Hierarchy problem.
51. Spontaneous creation from nothing: This has been a common theme in relation to the origin of universes. The most recent comes from the Wuhan Chinese Team: They have mathematical proof that the big bang could have been spontaneously arisen from nothing. Whether or not scientists can create new universes, perhaps using something like the Large Hadron Collider (LHC). Qing-yu Cai (2014) observed, *"space-time of our universe is a whole, it cannot be divided into small parts arbitrarily, even at LHC."* So, he concludes we cannot create universes ourselves. However, Q. Cai puts forward the bold hypothesis that his mathematics show how infinite Big Bangs could arise from nothing, like all concepts of the origin of universes, with the exception of the Big Bang.
52. Pentaquarks and quantum chromodynamics.
53. Proton decay.
54. String theory.
55. M theory.
56. Z, W bosons.
57. Heisenberg's Uncertainty Principle.
58. Photon.
59. Gluon.
60. Monopoles.
61. Many-worlds interpretation.
62. Spontaneous creation if infinite universes from nothing.

63. The Copenhagen Interpretation.
64. Big Bang concept.
65. Grand Unified Theory.
66. Theory of Everything.

CONCLUSION

Physics and cosmology are amongst the most pertinent and fascinating subjects of the universe, and they have contributed immensely towards understanding our realities of existence. They captivate the minds of scientists, philosophers, writers and the public in exciting ways. The list of partially resolved topics in physics and cosmology gives an idea of the state of knowledge about our universe and the enormous amount of further research needed to make the world, as Einstein would have wished, as comprehensible as possible. The dream of physicists, cosmologists and philosophers and of humanity at large is to feel they understand the universe. It is possible that a Theory of Everything can significantly impact on our capacity to much better understand our universe and existence and to know the why and how of existence. That would be a great journey both into the distant past and the future, for the whole of humanity.

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