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Quantum Mechanics as the Offspring of Classical Thought: A Philosophical Analysis of Continuity and Rupture

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Abstract: The study of the motion of bodies is referred to as mechanics. The study of the motion of subatomic particles is involved in the field of quantum mechanics. The argument that quantum mechanics is the offspring of earlier mechanics continues to be supported by this body of study. To maintain this perspective, the work traces the origins of the study of mechanics back to Aristotle. This research was subsequently rethought and given a new orientation in modern Newtonian mechanics. It is demonstrated in this work, via the use of the philosophical mechanism of analysis, that the disintegration of these two mechanics resulted in the development of quantum mechanics. The study makes the key observation that, when Quantum mechanics is compared with the two earlier types of mechanics, the concepts of objectivity, causality, determinism, and certainty characteristic of the earlier types are rendered obsolete within the framework of Quantum physics. The discussion concludes with the thesis that, given the current state of scientific research, which enables the unification of all domains of knowledge, the combination of metaphysics and science in the pursuit of greater human understanding ought to create a new dimension of knowledge acquisition.

Keywords: Quantum Mechanics; Human Knowledge; Subatomic Realities; Philosophical Mechanism; Newtonian Mechanics; Metaphysics and Science; Knowledge Acquisition.

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1. Introduction

The objective of this work is to unravel the concept and idea designated as Quantum mechanics. The work proposes the thesis that quantum mechanics is a progeny of past mechanics; hence, a historical survey of mechanics from the ancient through the classical, the contemporary, and the latest trend is undertaken. In this discourse, the work will lay bare the mechanics of each of the stated productive eras and investigate their principles, assumptions, and implications. Ultimately, the work shall engage in a philosophical scrutiny of quantum mechanics to uncover the embedded, unsavoury entailments [16]. Consequently, researchers shall conclude that the prevailing trend of compulsive unification of all realms of knowledge by the U theory, S-theory and M-theory; which has re-erupted the crisis of relevance between disciplines apart from it being portentous of the

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scriptural apocalyptic prelude to the universal eschatology is also significant as it inaugurates the replacement of the Einsteinian universe of space-time curvature by the prevailing insuperable African universe of Metaphysics –Science intermingling [17].

1.1. Ancient Aristotelian Mechanics

Aristotle's conception and explanation of motion in Ancient Western mechanics stands as the most comprehensive and sophisticated view ever articulated, upon which subsequent physics and mechanics could be validly described as paraphrases or anecdotes of Aristotle. In his Cosmology, Aristotle divided the universe into two parts: the terrestrial and the celestial regions. The moon marked the boundary between the earthly (terrestrial) sublunary region and the celestial (supralunary) realm. Bodies in the sublunary realm are made up of the four elements of earth, water, fire and air, which were impure, corruptible and imperfect. On the other hand, bodies in the celestial realm are made up of a fifth substance, Quintessence, which is incorruptible, perfect, pure, immutable and changeless. Aristotle conceived that motion was primarily determined in the two realms by the nature of substances prevailing in them. Motion in the supralunar realm was perfect (non-violent) and circular (non-rectilinear) because of the perfect nature of the substance in this realm. Whereas objects in the terrestrial realm are sustained in motion through the application of a local force and come to rest immediately the force is withdrawn, objects in the heavenly realm are in uniform perpetual motion because the primus mobile continually moves the spheres in heaven.

The implication of this position, viewing it via the Newtonian binoculars, is strange because it entails that the laws governing the motion of the heavens were a different set of laws than those that governed motion on the earth. The point to note, however, is that Aristotle's assumptions about motion were mainly philosophical speculations, largely devoid of experimental justification [13]. Aristotle assumed that the earth was at the centre of the universe. This geocentric assumption was later developed by the Egyptian scholar Ptolemy, who refined it using new astronomical data and mathematical calculations. Butterfield [6] observes that Aristotle's geocentrism and mechanics had a magnetic hold on the minds of medieval thinkers and persisted to serve as "the presiding issue" until the time of Galileo. Matthews and Patt [18] record that medieval Christian thinkers replaced Aristotle's unmoved mover with God and the place beyond the spheres as heaven, and upheld the geocentric view because it appears to justify the doctrine of original sin, which implied that the corrupt earth – the sublunar realm of imperfection, was inhabited by fallen mortals. Medieval theologians christened Aristotle and validated his geocentrism through a literal interpretation of portions of the Bible. At this juncture, it is pertinent to correlate some of the axiomatic postulates of the Aristotelian system into perspective, thus:

- Motion on earth is different from motion in heaven. This means that the laws governing motion on earth are different from those governing motion in heaven. The implication here is that there is no universal law of motion.
- The Earth is the centre of the universe because it has more mass than any other planetary body. This implies geocentrism.
- Bodies in the supralunar realm move in perfect orbs (circular movements) and are made up of an incorruptible element called aether.
- The Primum Mobile is the first mover that necessarily gives rise to motion both in the supra and sublunar realms. The Primum Mobile became the invisible spirit that controlled the motion of the universe. Butterfield [6] observes on this note that a universe constructed on the mechanics of Aristotle had the door halfway open for spirits already; it was a universe in which unseen hands had to be in constant operation, and sublime intelligences had to roll the planetary spheres around.
- In the terrestrial realm, objects with more mass or weight fall twice as fast as objects with less mass or weight. Also, objects fall immediately to the ground when the force that propels them is removed, since the Earth's natural state is rest. Hence, to explain the projectile's motion after the force is removed, they attribute it to air compression.

Over time, these axiomatic pillars of the Aristotelian system of mechanics have been given a technical knockout based on incremental evidence from evolving empirical observations and experiments. In another consideration, a head-on assault on the pillars of the Aristotelian system and by extension, the Church, was a kind of prevailing spirit or fashionable fad that characterised the philosophies of the Renaissance and the early modern period after the dark ages of the stifling of the spirit of enterprise and free-thinking by the Church. Thus, in what follows, it shall be shown how such affronts to the Aristotelian system led to the debunking of its pillars, the eventual waning of Aristotelianism, and the ultimate demise of Aristotelian mechanics. One of the stunning issues that Aristotelian mechanics could not satisfactorily address was the phenomenon of a projectile continuing in motion after the mover must have withdrawn force. This was a sequel to the Aristotelian position that a body drops immediately to the ground once the force is removed. Aristotelians argue that the continuous movement was due to air compression and movement. Unsatisfied with this explanation, Jean Buridan at the University of Paris in the 1300s and other Parisian scholars asserted that the projectile remained in motion because it acquired "impetus", a propulsive force which bodies are capable of acquiring once in motion. The emergence of the theory of impetus initiated the decline of Aristotelian-Ptolemaic mechanics, but the influence of the Aristotelian system and its ideas on the minds of later scientists. However, the patrician attempt to question the Aristotelian system, which the church fathers had sanctified as impeccable because it corresponded to biblical teachings, was an audacious move that prompted some suppressed sceptics to adopt deeper, more rigorous, and even heretical assumptions.

One of the offshoots of such anti-Aristotle and heretical scepticism was actualised in the Copernican reversal of Aristotelian-Ptolemaic Geocentrism. It was Copernicus [14] who advanced this free spirit of inquiry initiated by the Parisians. Instead of imbibing Aristotle's geocentrism as an infallible astronomical model, as medieval theologians did, he made recourse to the Greek thinker Aristarchus, who earlier conceived the universe as sun-centred, and inverted Aristotle's earth-centred astronomy into a sun-centred, heliocentric view of the universe. Remarkably, the switch of Copernicus [14] from Geocentrism to heliocentrism was not based on some profound observations and grandiose mathematical calculations that were superior to the Aristotelian-Ptolemaic system, but on revolutionary imagination associated with paradigm change which Kuhn [22] describes as "picking up the other end of the stick… a process that involves handling the same bundle of data as before, but placing them in a new system of relations with one another". An evidential corroboration from Copernicus [14] himself should suffice. In his On the Revolutions of the Heavenly Spheres, which was dedicated, suspiciously, to His Holiness, Pope Paul III, may be with the surreptitious intent to avert being called a heretic, he argues thus:

> *But you are waiting to hear from me how it occurred to me to venture to conceive any motion of the earth, against the traditional opinion… and common sense…. I was impelled to consider a different system of deducing the motions of the universe's spheres for no other reason than the realization that (Mathematicians) do not agree among themselves in their investigations of this subject…. For this reason, I undertook the task of rereading the works of all the philosophers which I could obtain to learn whether anyone had ever proposed other motions of the universe's spheres…. And in fact I found… Some think that the earth remains at rest. But Philolaus, the Pythagorean, believes that, like the sun and moon, it revolves around the fire in an oblique circle. Heraclitus of Pontus and Ecphantus the Pythagorean make the earth move… like a wheel rotating from west to east about its centre. Therefore, having obtained the opportunity from these sources, I too began to consider the mobility of the earth [14].*

Despite the display of exceptional brilliance and intellectual profundity in this transposing scheme of Copernicus [14], he could not provide satisfactory answers to the question of the cause of the motion of the Earth and other spheres. This was left for succeeding scientists. However, one salient point becomes apparent in both the Aristotelian stationary earth with mobile spheres and the Copernican mobile earth with a stationary sun. It is the fact of the relativity of motion. This shows that even the ancients were aware of the phenomenon of the relativity of motion with respect to a frame of reference before Einstein's relativity. The compulsive grip that the Aristotelian system and ideas had on the church led Catholics, Protestants, Lutherans, and Calvinists to forbid the teaching of Copernicus [14], revolutionary work, the Revolutions of the Heavenly Bodies, as unbiblical. The free-thinking spirit launched by these feats of revolt against the Aristotelian dogmatic intellectual dictatorship unleashed the freedom and liberty of thinking and enterprise that characterised the intellectual rebirth in the Renaissance period and the scientific and technological revolution in the modern classical Newtonian era.

1.2. Classical Mechanics

Classical mechanics is the branch of physics that describes the motion of macroscopic objects using the ideas and laws developed by Isaac Newton and his 17th-century contemporaries, such as Goldstein et al. [7]. Tycho Brahe played a leading role in collecting monumental observational data on the planetary courses. Based on the reservoir of data available to him, he proposed an anti-Copernican system, thus:

> *I am of the opinion, beyond all possible doubt, that the earth, which we inhabit, occupies the centre of the universe, according to the accepted opinions of the ancient astronomers and natural philosophers as witnessed by Holy writ, and is not whirled about with an annual motion, as Copernicus wished. Yet, to speak the truth, I do not agree that the centre of motion of all the orbs of the secundum mobile is near the earth, as Ptolemy and the ancients believed [24].*

This anti-Copernican stance of Brahe has not been celebrated, since Brahe, unlike Copernicus [14], did not support his position through elaborate mathematical calculations. It was Byrne [1] who subjected the mountains of Brahe's momentous observational data to mathematical elaboration. Through his research, he demonstrated a non-deistic mechanical explanation of the motion of the planets, which Aristotle attributed to the primum mobile. He also decisively broke away from the ancient axiom that all celestial motions are both uniform and circular. Kepler's findings had expression in three scientific laws. The first law of planetary motion, Kepler's law of elliptical orbits, states that planets' orbits around the sun are ellipses, not circles. So, the first law substituted the ellipse for the circle as the descriptive motion of planets. This shattered the ancient Aristotelian concept that planets orbit in perfect circles. The second law states that a planet's speed is not uniform but varies with its distance from the sun. The farther a planet is from the sun, the slower it is and vice versa. He also demonstrated mathematically that the sun's gravity keeps the planets in orbit. This predated the laws of universal gravitation formulated by Galileo and Newton. The third law established a relationship between a planet's average distance from the sun and the time it takes to complete a single orbit. Kepler is famous for his new approach to observing data, evident in his attempt to formulate physical laws using mathematical equations as models of scientific laws. The mathematization of science was a symbolic index of modern science. Kepler also conceived the universe as a mechanical clockwork controlled by a universal physical force rather than the divine force proposed by Aristotle and the Scholastics. The evidence of this momentous idea is couched by him thus:

> *The investigation of the physical causes occupies me greatly. My aim in this is to show that the celestial machine is to be likened not to a divine organism but rather to a clock work…, insofar nearly all the manifold movements are carried out by means of a single quite simple magnetic force, as in the case of a clock work [14].*

Galileo Galilei [4] achieved enormous breakthroughs, made indelible contributions to Astronomy, and had a profound impact on mechanics. He constructed and used the first telescope for planetary observations. His discoveries through these sightings that the sun had dark spots, the moon - depressions and elevations, Jupiter - moons orbiting it, etc, led to the displacement of the Aristotelian position that the celestial spheres are spherical and quintessential. His most profound achievement was in mechanics (motion). Presenting his major argument to support Copernicus's [14] motion of the earth, he asserts thus:

> *First, if we consider only the immense magnitude of the starry sphere compared to the smallness of the terrestrial globe and weigh the velocity of the motions which must in a day and a night make an entire revolution, I cannot persuade myself that there is any man who believes it more reasonable and credible that it is the celestial sphere that turns round. In contrast, the terrestrial globe stands still [14].*

He also explained the dilemma of why the earth will not spin off its axis and why objects thrown upward on earth do not fall before or after the spot they were thrown, since, according to Copernicus [14], the earth was moving from West to East. He used the idea of universal attraction towards the sun to explain why the Earth and other planets do not spin off during rotation and revolution. His attribution of the force of universal gravitation to both terrestrial cum celestial motion knocked out the Aristotelian claim that motion on earth is violent while celestial motion is perfect. He introduced the principle of inertia to explain the motion of projectiles, replacing the notion of impetus of the Parisians. Galileo employed the experimental method to debunk Aristotle's claim that "heavier objects will fall faster than lighter ones". Beyond the myth and controversy surrounding the authorship of the Tower at Pisa experiment, Galileo, who was a Professor at Pisa, is said to have used the experiment to demonstrate that a feather and a cannonball in a vacuum, thrown from a height, will land together since, according to him, freely accelerated bodies do not gain weight. He showed that the acceleration of a falling body is proportional to time and independent of its weight and density.

He explained that heavier objects seem to fall more speedily, not because of weight but because of air resistance. Though some people view this experiment as a thought/mind experiment rather than an actual one, it is established that Galileo placed his experiments on an elaborate mathematical pedestal. One of his mathematical explanations of the universe was a law stating that the force of gravity experienced by a body is inversely proportional to the distance from the sun. So, it was Galileo who bequeathed the experimental method of mathematics to the modern world. The experimental mathematical method of Galileo would not have succeeded without the complementation of ideas and works of his predecessors, like Kepler's copious mathematical laws of the universe derived from Brahe's observation data, and his contemporaries and successors like Marin Mersenne; a scientific collector, Pierre Gassendi; a philosopher who also possessed encyclopedic scientific knowledge, Rene Descartes; a philosopher, mathematician and physicist, Thomas Hobbes etc. The historian Butterfield [6] describes Galileo as the father of modern mechanics and of experimental science and notes that:

> *Galileo gives the impression of having experimented so constantly as to gain an intimacy with movement and structures; he has watched the ways of projectiles, the operation of levers and the behaviour of balls on inclined planes, until he seems to know them... the way that some know their dogs [14].*

Sadly, since Galileo's mechanics and astronomy validated the heliocentrism of Copernicus [14], and thus constituted an assault on Aristotelianism and Scholasticism, like Copernicus [14], who was branded a fool and a heretic by Luther the reformer and the Church, the works of Copernicus [14], Kepler and Galileo were later proscribed under the Index Librorum Prohibitorum as false teachings and opposed to Holy scriptures. Galileo was forced to recant his Copernican thesis. Though he submitted to the coercion of the Church in recanting his scientific thesis, it has to be stated that he only submitted his body to the pressure of the Church while his mind remained irrepressible. The submission of the mind entails the submission of the intellect. That can only be secured through the power of superior reasoning. Intellectual submission cannot be achieved by physical force, any more than mundane force can make a person understand the principles of science. Despite Galileo's status and fame as the founder of classical mechanics, it was Isaac Newton who propelled it to its pinnacle. It was based on the monumental synthesis of Copernicus [14], Kepler, and Galileo in Newton's Principia that the trio's works were acknowledged as not contrary to the Bible. The inhibited triumph of those early pioneers of science was accomplished [21]. Isaac Sholium on Absolute Space and Time was the young Physicist who synthesised the research of Copernicus [14], Kepler and Galileo into an organic, formidable whole in his Mathematical Principles of Natural Philosophy (Philosophia Naturalis Principia Mathematica). Recognising his debt to early scientists, Newton remarks that he was able to see beyond others because he was “standing upon the shoulders of giants” [4]. Newton is famous in the world of science for his numerous legacies, including the three laws of motion, which describe terrestrial motion.

1.3. Newton’s Three Laws of Motion

The first law, also called the law of inertia, states that a body at rest remains at rest and a body in motion remains in motion, unless acted upon by an external force. It explains that all bodies are either at rest or in motion until acted upon by an external force, which causes them to change from rest to motion or vice versa. This law is tenable at a certain macroscopic level, where one seems to observe motion and its cessation. However, at the microscopic level, the fundamental units from which the macro world is constituted are said to be in perpetual motion. Consequently, since the micro units of reality are perpetually in motion, the macro world, which is made up of micro elements, cannot be said to be capable of being at rest. Moreover, the idea of rest at the macro level is untenable considering the constant rotation and revolution of planetary bodies. This law also erroneously presumes that a body can exist without being acted upon by natural forces. Such a state is nonexistent and mythical. There is no time that a body is not influenced by one external force or another. Even when bodies appear to be in a seeming state of rest or motion, forces are acting upon them.

The second law states that a force acting on a body causes a change in momentum proportional to the applied force and in the same direction as that of the force. Alternatively, this law states that the acceleration of a body is directly proportional to the net force acting on it and inversely proportional to its mass. The formula is F(Force)=m(mass) × a(acceleration). This law states that acceleration increases or decreases proportionally to the magnitude of the applied force. This law might have high utility at the macro level. Still, at the micro level, where researchers cannot determine the momentum and position of micro-particles with certainty, it crumbles. The third law states that for every action, there is an equal and opposite reaction. In explanation, the law says that when you stand on the ground pressing it, exerting a downward force on it, there is an upward force exerted by the ground on you. This is why objects maintain equilibrium where the net force is zero, and each force cancels out the other. This law is also beset by uncertainty at the micro level. Apart from Newton’s achievement in Dynamics, as revealed in his laws of motion, he also made groundbreaking contributions to astronomy, including his law of universal gravitation and the invention of the reflecting telescope. His law of universal gravitation is discussed below. Newton was still struggling to make sense of how his terrestrial laws relate to celestial motion when, in a contemplative leap occasioned by his observation of the falling of some fruit from a tree, he deduced:

> *From whatever height in our hemisphere these bodies might fall, their fall would certainly be in the progression discovered by Galileo, and the spaces transverse by them would be equal to the square of the time taken. This force which makes heavy bodies descend is the same, with no appreciable diminution, at whatever depth one may be in the earth and on the highest mountain. Why shouldn’t this force stretch right up to the moon? And if it is true that it reaches as far as that, is it not highly probable that this force keeps the moon in its orbit and determines its movement? But if the moon obeys this principle, whatever it may be, is it not also reasonable to think that the other planets are similarly influenced?*

Utilizing his laws of terrestrial mechanics, Kepler’s three laws of celestial mechanics, and Galileo’s law of inertia, and his contemplative leap, Newton demonstrated and broached the principle of universal laws of motion which hold that the laws of physics that operate on earth also operate in heaven and the principle of universal gravitation which holds that all bodies in the universe are acted upon by the force of gravitational attraction and in reaction exert the same force of attraction on one another and as such are kept in uniform motion. These postulates of Newton dealt the final blow to Aristotelian cum scholastic dichotomy between terrestrial and celestial mechanics and explained the puzzle of what kept planetary bodies in motion. Newton’s mechanical reductionistic explanation of the universal phenomena in natural laws earned him the pride of place as the synthesiser of classical mechanics, whose prominence is captured in Alexander Pope’s famous couplet: “Nature and nature’s laws lay hid in night: God said let Newton be! And all was light [12].

1.4. Philosophical Assumptions of Classical Mechanics

According to Classical physics, which is mostly based on the theories of Newton, the following philosophical assumptions could be deduced:

- Mechanistic view of the universe: The universe is viewed like a clock or giant machine whose parts function in perfect harmony and regularity.
- Determinism, Certainty, and Prediction: Explaining these assumptions as they pertain to Newtonian mechanics, Zukav [5] observes that, through Newton's laws of motion, researchers can predict or retrodict (predict the past) with precision. Thus, if researchers know an object's position and velocity at any time, they can predict where it will be at

a later time or where it was at an earlier time. This implies that nature is determined, that every effect has a cause, and that scientists can describe nature with certainty. Both Newtonian and Quantum mechanics are alike in being predictive. The difference is that prediction in Newton is certain, while it is uncertain and probable in Quantum mechanics.

- Absolutism: The determinism of Newton's mechanics implied the necessity of the existence of some absolute measurement systems, quantities or dimensions. In his *Scholium on Absolute Space and Time,* Newton discusses the existence of Absolute Time, Absolute Space and Absolute Motion as extrinsic reference frames that are unchanging and immovable. Newtonian reality is objective, while the Quantum reality is relative or observer-created.
- Dualistic Conception of reality as particle or wave.

1.5. Albert Einstein and the Transition from Classical to Quantum Mechanics

Granted that the old Aristotelian mechanics reached its anticlimax in Newtonian mechanics, Newtonian mechanics, which was the pinnacle of classical mechanics, met its anticlimax in Einsteinian mechanics, and mechanics finally transitioned to the Quantum. Relating this point, Pagels [8] observes that:

> *Like Isaac Newton two centuries before him, Albert Einstein is a major transitional figure in the history of physics. Newton accomplished the transition begun by Galileo, from medieval scholastic physics to classical physics; Einstein pioneered the transition from Newtonian physics to the Quantum theory of atoms and radiation, a new non-Newtonian physics [19].*

Einstein's accomplishments in physics are gargantuan. Here, researchers can only sketch an outline of his transitional feats from classical to quantum mechanics, which are contained in his Dutfield et al. [19] paper published in 1905 in the journal Dutfield et al. [19]. The four papers were on Special Theory of Relativity, Photoelectric effect, Brownian Motion and Mass Energy Equivalence. The essential ideas and submissions of those papers will be discussed in the accompanying discourse.

2. Special Theory of Relativity

The STR of Einstein is predicated on two postulates, namely, the relativity of motion postulate and the constancy or absoluteness of light velocity postulate.

2.1. The Relativity of Motion Postulate

Before Einstein [3] and Isaac Newton introduced three absolute quantities in their mechanics: absolute motion, absolute time, and absolute space. The term ‘absolute’ is employed to qualify these quantities to portray their non-contingency, independence and unconditional existence. Motion is defined as a change in position. Galileo had earlier observed that for the motion of a body to be established, it has to be done by relating it to the motion of another body. This means that how fast or slow an object moves depends on how fast or slow another object moves. Galileo ruled out the possibility of motion that can occur without being related to another motion. In essence, Galileo supported the principle of the relativity of motion and opposed the idea of absolute motion, a kind of motion independent of other motions. Galileo’s principle of relativity is documented in his “*Dialogue Concerning the Two Chief World Systems*”. In this dialogue, he recorded that it will be impossible to decide whether an object is moving or at rest without relating or comparing it to another object. Galileo advanced the idea of the relativity of motion to a law of physics and noted that this law holds in all inertial reference frames. This means that motion is a relative, not an absolute, quantity. The relativity of motion postulate can be further illustrated by observing two people: one in the train and one on the platform. The person on the platform sees himself as standing still while the person in the train and the train are moving. In the reverse, the person in the train sees himself as standing still while the person on the platform seems to be moving past him. A deeper reflection reveals that everything, including the train, the person in the train, and the one on the platform, is moving because the earth on which they are moving is moving.

The Earth, the sun and the galaxy are constantly in motion relative to each other. Though everything in the universe is in motion, there is no way of determining that motion is occurring except that researchers compare or relate the motion of one entity to another. This proves that motion is not an absolutely independent quantity but rather a relative one. Under this framework of the relativity of motion, it should be noted that the speed of entities from one reference frame to another changes or varies depending on the reference frame. For instance, your speed while driving at 100km/h is different from the speed you have while walking on the road. This describes Einstein [3], the first postulate of relativity, which holds that motion is relative and depends on the reference frame. However, Einstein [3] pointed out in his second postulate that, although the relativity of motion makes the speed of everything depend on the reference frame, there is an entity whose speed is unaffected by it. This entity is light. The speed of light remains constant or absolute from reference frame to reference frame. This will be explained in the discussion on the second postulate. Newton appreciated the idea of relativity of motion; however, he reasoned that for an object to be able to come to rest or be in motion, as contained in his first law of motion, there must be an underlying perpetual absolute motion which provides the framework for things to be at rest or in motion. Evidently, it is plausible to assert that Newton's conception of absolute motion was to justify his first law of motion. Einstein's first postulate of relativity, which is called the relativity of motion postulate, was simply a restatement or reaffirmation of the Galilean principle of relativity. It portrayed the meaninglessness of absolute motion by reiterating the Galilean relativity principle. Einstein did not stop at just repudiating the idea of absolute motion; he also extended the principle of relativity of motion to the electromagnetic realm.

The principle of relativity, which Galileo propounded in the 17th century, was thought to only apply to the realm of mechanics and not that of electromagnetism. 19th-century physicists reasoned that Galilean relativity would not apply in the electromagnetic reference frame, since that frame falls outside the laws of mechanics formulated by Galileo and Newton. The laws of electromagnetism, formulated by James Clerk Maxwell, were distinct from the laws of mechanics propounded by Galileo and Newton. Motion in the electromagnetic realm is said to be faster than any observable motion in the mechanical realm. Maxwell's calculated speed of electromagnetic waves gave the same result as the speed of light calculated by Ole Romer in 1676. This result corroborated the fact that light itself is an electromagnetic wave. The radical contribution of Einstein in this scheme was his revolutionary opinion that the Galilean relativity principle should be applied to the electromagnetic realm. Elucidating the reason for his extension initiative, he notes that "the principle of relativity must therefore apply with great accuracy in the domain of mechanics. But that a principle of such broad generality should hold with such exactness in one domain of phenomena, and yet should be invalid for another, is a priori not very probable" Einstein [3]. It has to be remarked at this juncture that Einstein's pursuit to generalise the principle of relativity and unify the two domains turned out to be a mantra that pervaded his entire intellectual sojourn.

2.2. The Constancy or Absoluteness of the Velocity or Speed of Light Postulate

This postulate asserts that the speed of light is constant or absolute in all inertial reference frames. Einstein's quest to extend the principle of relativity to the electromagnetic realm was an attempt to universalise the laws of physics across all reference frames. This encountered a seeming incompatibility because all speeds in the mechanical realm are supposed to be varied or relative. However, the speed of light appears to be inconsistent with this tenet of relativity because the speed of light does not vary or change regardless of whether the reference frame is fast or slow. Light travels at an unsurpassable speed of 300 million metres per second, which is about 186,000 miles per second, or 7½ times around the Earth. The speed of light is absolute because no matter the medium that light passes through, it does not alter its motion by being slower or faster like the speed of other waves, like sound or other bodies and objects that change their speed or motion relative to the medium in which they travel or their inertial reference frames. Exposing what appears to be incompatibility, Eckstein [2] explains thus:

> *Thus, this beautiful theory of Maxwell, which was distilled out of a large body of experimental work and which itself was afterwards splendidly confirmed, demonstrates that the speed of light in a vacuum is a constant of nature. If we accept that the relativity principle not only applies to mechanics, then it must also be true that Maxwell's equations apply in any inertial frame, with the same values for the constant of nature. The speed of light would be a constant whose value would be the same in every inertial reference frame. The speed of the forward shining light of a forward-moving locomotive must be exactly equal to that of one at rest or even one moving backwards! The speed of light is thus independent of the movements of its source. This, however, contradicts the vector addition of speeds, which we have presented as a fact within Newtonian mechanics. Eckstein, David. Epstein Explains Einstein: An Introduction to both the Special and the General Theory of Relativity [2].*

Contrary to the apparent incompatibility or irreconcilability between the absoluteness of the speed of light and the principle of relativity of motion, Einstein notes that "in reality there is not the least incompatibility between the principle of relativity and the law of propagation of light" [2]. The most significant research of Einstein, among others, was in determining the nature and relationship between space and time. Classical mechanics held that space and time are absolute dimensions of measurement. Einstein, in his *"Special Theory of Relativity"*, holds that time and space are relative dimensions dependent on an inertial reference frame [3]. An Inertial reference frame is the frame of reference that is in constant uniform motion. Since all the inertial frames are in relative motion, Einstein [3] deduces that there is no motionless, absolute fixed frame of reference anywhere in the universe. All motion is seen as relative to some other moving body. Therefore, if two systems move relatively to each other, it implies two different spaces and two different times. Thus, there is no simultaneity of occurrence based on simultaneous time and space, but the seeming simultaneity of occurrence is relative to time, space and motion.

Einstein's position was based on his postulate that the speed of light is constant in all inertial reference frames, contrary to the classical position that light changes in speed as it crosses from one frame to another. Einstein [3] demonstrates this absoluteness of light by showing that no object has been able to reach the speed of light, in that if any object attempts to approximate it, the object will be shredded into particles of energy, which is transformed into light itself. This idea is implied in his equation $E = mc^2$, meaning that energy, E, is equivalent to m(mass) x speed of light (c)squared. The concepts of time and space relativity, contraction, and other crucial ideas were developed from Einstein's Special Theory of Relativity (STR. Einstein was led to these concepts by insights he derived from the various thought experiments (Gedankenexperiments) he conducted. A thought experiment is an imaginary intellectual exercise involving an event that seems contrary to real-life experience. This character of or element of being apparently opposed to experiential facts makes it otherwise called a counterfactual experiment. Some of the thought experiments associated with Einstein are:

- **The Light Beam Chase:** Special Relativity, Einstein imagined himself chasing a light beam. He realised that if he were to catch up to the light, time would appear to stand still for him relative to outside observers. This led him to propose the special theory of relativity.
- **The Elevator:** Equivalence Principle, Einstein envisioned an elevator in free fall. He realised that the effects of gravity are equivalent to the effects of acceleration. This thought experiment led to the development of the general theory of relativity.
- **The Train and Platform:** Relativity of Simultaneity, Einstein imagined two observers, one on a train and the other on a platform. He demonstrated that two events that are simultaneous for one observer may not be simultaneous for another, challenging traditional notions of time and space.
- **The Twin Paradox:** Time Dilation. Einstein imagined that if researchers had a set of twins on Earth and one was sent into space at a speed approaching the speed of light, time for the twin going into space would be slower than time for the twin on Earth. Thus, when the twin returns to Earth, the twin on Earth will be far older than the one who travelled due to time dilation when an object approaches the speed of light.
- **The Photon Box:** Quantum Mechanics, Einstein imagined a box containing photons. He demonstrated that photon energy is quantised, laying the foundation for quantum mechanics.
- **The Riverboat:** Relativity of Length, Einstein envisioned a riverboat moving downstream. He illustrated that the length of an object appears shorter to an observer in motion relative to a stationary observer.
- **The Moving Rod:** Relativity of Length, Einstein pictured a rod moving relative to an observer. He demonstrated that the length of the rod appears shorter to the observer due to length contraction.

These thought experiments demonstrate Einstein's creative and intuitive approach to physics. By exploring complex concepts through simple, imaginative scenarios, he challenged conventional wisdom and developed groundbreaking ideas. Some of the extraordinary spooky notions generated from these thought experiments include.

2.3. The Notions of Time Dilation or Time Relativity and Length Contraction

Before Einstein, there were various conceptions of time. Time was conceived variously as mystical, subjective, unknowable, divine, etc. Isaac Newton, through the works of Galileo, was able to reduce time to a mechanical, measurable, predictable and absolute quantity. Time was an absolute for Newton because it was an objectively given phenomenon. Since Time was conceived by Newton as absolute and objective, it means Time does not depend on or relate to any other parameter for its determination. Time for Newton exists independently of motion and space. This absoluteness and independent existence of time, devoid of the influence of other parameters, was what Einstein overturned and overhauled in his light-beam chase thought experiment. Time dilation means that time passes more slowly when an object is moving at the speed of light, and more quickly when it is moving slower than the speed of light. This proposition suggests that time is relative to a reference frame. Hence, the time dilation or the relativity of time proposition refutes Newton’s assumption of time as an absolute. Einstein also used his thought experiments to demonstrate that length or space contracts when an object approaches the speed of light and expands when an object is slower than the speed of light.

2.4. General Theory of Relativity

Einstein proposed his general theory of relativity in 1915 [25]. This theory extended his relativity concepts of space and time established in his Special Theory of Relativity to cover the Gravitational field, resulting in a universal law, or general theory, that applies throughout the cosmos, akin to Newton’s universal Gravitational law. In his research, Einstein established the energy-mass equivalence and noted that every massive body contains energy that attracts other massive bodies, thereby curving the space around it. But every matter (object) is a conglomeration of space and time because matter cannot exist in oblivion but in a particular place and at a particular time. Since matter is equivalent to energy, the curvature of space caused by the energy attraction between bodies is the curvature of space-time. Thus, the attractive force that Newton called ‘gravity’ is the curvature of space and time. This development decapitated Newton’s universal law of gravitation, and in its place emerged Einstein’s General Theory of Relativity. Einstein’s General Theory of Relativity overturned the idea of an independent objective space presupposed in Newton’s Universal Gravitation Theory. Einstein asserts thus:

I wish to show that space-time is not necessarily something to which one can ascribe a separate existence, independently of the actual objects of physical reality. Physical objects are not in space, but these objects are spatially extended. In this way, the concept of empty space loses its meaning.

2.5. The Photoelectric Effect

In his 1905 paper, Einstein asserts that electrically charged particles are emitted from a metal when a beam of light shines on its surface. This phenomenon is called *"The Photoelectric Effect"*. Einstein deduced the characteristic nature of light from this phenomenon. Based on his observations, Einstein asserted that light is composed of particles called light quanta (photons), or tiny packets of energy. This position contradicted the classical position, which held that light is wavelike. Einstein's discovery shows that the explanatory power of classical mechanics is inadequate for understanding the behaviour of subatomic particles such as photons. This discovery by Einstein inaugurated physicists' search for the proper understanding of the nature of subatomic particles, which culminated in Quantum mechanics. Also, Einstein's discovery of the paradoxical nature of light had a devastating effect on his General Theory of Relativity (GTR). The GTR extends the Special Theory of Relativity (STR) to planetary bodies and the entire universe. The extension of the STR to the entire universe was premised on the fact that the universe is a continuum, like a field, rather than discontinuous, as in the quantum photon. Now that the universe is made of discrete (discontinuous) particles and also wavelike, the GTR of Einstein, which was based on the continuous conception of the universe, collapses. Realising the devastating effect this has on his theory, Einstein said, "I consider it quite possible that physics cannot be based on the field concept, i.e. on continuous structures. In that case, nothing remains of my entire castle in the air, gravitation theory inclusive (and of) the rest of modern physics". Physicists like Pagels [8] regard Einstein as the last classical Physicist. He notes that "Einstein, who opened the route to the new quantum theory that shattered the deterministic worldview, rejected the new quantum theory. He could not intellectually accept that the foundation of reality was governed by chance and randomness".

3. Quantum Mechanics and the Unified Field Theory

This branch of physics is derived from two terms: "Quantum" and "Mechanics". Zukav [5] explains that "quantum" means quantity or a specific amount of something, whereas "mechanics" means motion. Thus, Quantum mechanics is the study of the motion of quantities. Quantum theory opines that nature comes in "Quanta" (bits and pieces or discrete quantities), which may appear as particles or waves in nature. Quantum mechanics is the study of this phenomenon of the particle–like and wavelike nature of matter. Quantum mechanics, unlike Classical mechanics, studies the behaviour of matter at the subatomic or micro-level. The idea of the indivisibility of atoms was still prevalent in Newton's time (1600s) until the 1800s, when physicists began studying atomic and subatomic phenomena. Quantum mechanics (Norton [9], "*Origin of Quantum Theory*", online) emerged in 1900, when Max Planck investigated black-body radiation. Radiation involves the dissemination of energy from a source. A body that absorbs all the radiation that falls on it before re-radiating it is called a black body [9]. Planck discovered that excited atomic oscillators (black bodies) emit and absorb energy only in specific quantities (quanta) or (packets of energy). This remarkable position regarding the nature of subatomic particles contradicted the classical-mechanics view that energy is continuously released, like a wave, which aligned with the continuum conception of nature. Going by Planck's discovery, the subatomic world is discontinuous or discrete in nature, as opposed to the continuous nature of the macro-world. Albert Einstein keyed into this idea and made an audacious move by "stating that light consists of packets or discrete energy which he called photons" [15]. Unlike Planck, who said that energy comes in quanta (packets), Einstein said that light itself is quantised energy.

Bearing in mind his equation of the equivalence between energy and light, one will not be surprised by this description. The implication of this photoelectric effect is that light, which was conceived by the classicals as a wave in allegiance to Thomas Young's wave theory of light, is now seen as possessing a particle-like or corpuscular nature. Strikingly, Quantum mechanics commenced on a paradoxical note. Before the discovery of Max Planck, the traditional notion of energy held that it flowed in a continuous, unbroken stream, like a smooth, unbroken stream of water. Planck's experiment on the radiation of black bodies, which led to the discovery that energy could be emitted or absorbed in discrete units, was very odd, as it implies that energy is discontinuous rather than continuous, contrary to the traditional view. This result was so incredible even to Planck that he doubted it and gave it credence only when Einstein corroborated it in 1905 with his position that light (energy) is also emitted in discrete particles, quanta, or photons. Before this time, light had been viewed as a continuous electromagnetic wave. The positions of Planck and Einstein led to the paradox that light behaves both as a continuous electromagnetic wave (as conceived by Maxwell in his electromagnetic theory) and as a discrete particle (as conceived by Planck and Einstein).

All the attempts by Physicists to use the classical model to explain this behaviour of atoms were unsuccessful. This aroused scientists' curiosity to study the fundamental structure of matter more closely. Niels Bohr was one of the radical band of scientists who attempted to explain this weird nature of the fundamental particles of reality. Both solved the mystery by using the analogy of the solar system to explain the structure of an atom. Just as the solar system has many planetary bodies orbiting the sun, an atom has many tinier particles, called electrons, orbiting its nucleus. He said that electrons used to leap from one fixed orbit to the other in what is called a Quantum Leap. This happens when an atom is heated, causing its electrons to become agitated or excited. It is the leap of electrons that is used to emit energy in the form of light. The most curious aspect of this leap is that the electron jumps from one orbit to another, mysteriously without traversing the space between them. He argued that the leap occurred in such a weird manner because the energy of an electron is emitted in a discrete, noncontinuous manner such that it cannot be subdivided. Thus, an electron is either in one orbit or another and cannot be in between. The works of Planck and Einstein had a remarkable effect on Prince Louis de Broglie, leading him to postulate that particles of matter should similarly exhibit wavelike behaviour, since light waves exhibit particle-like behaviour [15]. Buttressing his radical position, De Broglie asserts thus:

> *On the one hand, the quantum theory of light cannot be considered satisfactory since it defines the energy of a light particle(photon) by the equation E=hf containing the frequency f. Now, a purely particle theory contains nothing that enables us to define a frequency; for this reason alone, therefore, we are compelled, in the case of light, to introduce the idea of a particle and that of frequency simultaneously. On the other hand, determination of the stable motion of electrons in the atom introduces integers, and up to this point, the only phenomena involving integers in physics were those of interference and of normal modes of vibration. This suggested to me that electrons, too, could not be considered simply as particles, but that frequency (wave properties) must be assigned to them.*

Thus, De Broglie attributed the particle-wave duality to both light and waves. Erwin Schrödinger, inspired by De Broglie's matter waves, hypothesised that electrons, which are conceived as hard spherical particles revolving around an atom's nucleus according to Bohr's planetary model, are not spherical particles but patterns of quantised standing waves. This aligned with Planck, Einstein and De Broglie. A detailed account of the contributions of different scientists to the Quantum phenomenon is monumental and varied. However, the various strains are encapsulated and synthesised within the different postulated principles and canons of interpretation advanced by quantum scientists in their exposition of quantum theory. What follows is only an anecdote of the broader picture, serving only as a synopsis that highlights the most salient principles and interpretations of Quantum Mechanics.

3.1. Principles and Canons of Explanation of the Subatomic (Quantum Mechanics) Reality

Wolfgang Pauli's Exclusion Principle: Before Schrodinger discovered electrons as "standing waves," Norton [9], in 1925, discovered that no two electrons can exist in an atom with the same properties. Pauli observed that the presence of an electron with one particular set of properties excluded the presence of an electron with a similar property. Pauli's finding came to be called the exclusion principle.

Max Born's Indeterminacy Principle: Reflecting on Schrödinger'sger'stification of electrons as Hawking [20] observed in 1926 that those waves are not real entities but are probability waves. Pagels [8] remarks that Born's interpretation marks the birth of the idea of the God who plays dice and the end of determinism in physics. Born's position explains that, since subatomic phenomena possess these dual properties and there is no precise way to predict the outcome of a single measurement of those properties, all that quantum theory can predict is the probability that a quantum phenomenon will possess this or that property. Thus, it is the probability or statistical approach rather than the precise, deterministic approach that can be used in measuring quantum phenomena. This entails that quantum phenomena possess an indeterminable nature; hence, Born's principle was called the principle of indeterminacy.

Heisenberg's Uncertainty Principle: In 1927, Heisenberg [23] postulated the uncertainty principle guiding quantum phenomena. The mathematical background of this principle can be traced to Heisenberg [23], matrix mechanics. In his matrix mechanics, he showed that if two matrices, p and q, are used to represent the particle's position and momentum, then. They have the property that p x q does not equal q x p. It is impossible to simultaneously measure the momentum and the position of the particle with precision or certainty. Heisenberg [23] discovered that in the subatomic realm, this kind of uncertainty prevails. In his exposition of this notion of uncertainty, Popper [11] said "according to Heisenberg [23], uncertainty relations, every measurement of the position interferes with the corresponding measurement of the component of the momentum, Describing the uncertainty interpretation of quantum theory, Heisenberg [23] said "the more precisely the position is determined, the less precisely the momentum is known in this instant, and vice versa". Heisenberg [23] uncertainty principle constitutes the major theoretical framework for the Copenhagen interpretation of Quantum mechanics.

Bohr's Complementary Principle: Following the indeterminacy and uncertainty principles of Born and Heisenberg [23], the philosopher Bohr offered a philosophical interpretation of the wave-particle duality and the contradictory relationship between position and momentum in subatomic reality. Pagels [8] explains that according to Bohr, the wave-particle behaviour of an electron, though mutually exclusive or contradictory, is nevertheless complementary properties of the same reality in the absence of which knowledge of the subatomic reality will be inadequate. This means that, though observing one of these properties of subatomic reality excludes or blurs the observation of the other, knowledge of the two is fundamental to a holistic understanding of the reality.

Copenhagen Canon of Interpretation: The uncertainty principle of Heisenberg [23] and Bohr's complementary principle constitute what is called the "Copenhagen interpretation of quantum mechanics". It is called the Copenhagen interpretation because Bohr and his research assistant, Heisenberg [23], worked in Copenhagen, Denmark. Pagels [8] remarks that the two vital points that emanated from the work of the duo, which constituted the Copenhagen canon of interpretation, are Quantum reality is statistical and not certain. The physical properties of quantum objects are observer cum experiment created, thus, there is no objective world in which these properties existed independent of observation. Summarising the Copenhagen interpretation, Pagels [8] says:

- The Copenhagen interpretation of quantum theory rejected determinism, adopting a statistical view of reality, and it rejected objectivity, accepting instead that material reality depended in part on how researchers choose to observe it. After hundreds of years, the worldview of classical physics fell.
- Bohr presented the Copenhagen interpretation of quantum theory at a 1927 conference attended by distinguished physicists, including Einstein. Einstein criticised this interpretation virulently because of the indeterminism of reality it presupposed. The substance of his reaction to the Copenhagen interpretation was the ERP argument.

3.2. Einstein, Podolsky and Rosen (EPR) Interpretation

This disagreement between Einstein and Bohr over the Copenhagen interpretation led Einstein to present a position in the 1935 paper "Can Quantum-Mechanical Descriptions of Physical Reality Be Considered Complete?", alongside Boris Podolsky and Nathan Rosen. Basically, they argue that, under the Copenhagen interpretation, quantum theory is incomplete because it cannot explain certain aspects of reality. In the "thought experiment" they proposed to debunk the uncertainty of the quantum theory, Pagels [8] explains that they argued that the position and the momentum q and p of two particles 1 and 2 who upon interacting at point p, fly away to London and New York respectively, can be measured simultaneously without uncertainty, that is, without the measurement of the position and momentum of particle 1 altering the momentum and the position of particle 2. Thus, if the sum of the momentum of the two particles is $p = p_1+p_2$ and the distance between the two particles is $q =q_1-q_2$, then the momentum of particle 2 is $p_2 =p1–p_2$ and the distance of particle 2 is $q_2 =q_1-q$. Though the measurement of position q_1 may blur the previous measurement of its momentum p_1 of particle 1, it will not alter the deductions for particle 2. Note that at the point of interaction of the particles, the two of them become alike in properties. As such, the determination of the momentum and position of one implies the same determination for the other. The EPR thought experiment assumes that the determination of the quantities of particle one cannot instantaneously influence or blur the determination of the quantities of particle two, because they are far apart. There is no mediation or causal link between them. The EPR's position is based on the assumption of the local causality principle. This principle, according to Pagels [8], states that "distant events cannot instantaneously influence local objects without mediation". The EPR experimenters then assert that there is a way of determining the position and momentum of a subatomic object without uncertainty. Hence, they conclude that the Copenhagen quantum interpretation is incomplete in its explanation of quantum phenomena.

3.3. Latest Trend in Quantum Mechanics

Einstein was distressed by the emerging contradiction and incompatibility between macro and micro mechanics, as revealed by the determinacy presupposed by the former and the indeterminacy implied by the latter. Hawking [20] explains that Einstein particularly objected to the introduction of unpredictability and randomness in science, despite the fundamental role he played in its emergence. He never accepted the quantum indeterminacy principle because, according to him," *God does not play dice*", and accepting it will entail that the universe is governed by chance. In his attempt to remedy the science of this bleak outcome, he began exploring the possibility of unifying his general theory of relativity, which explains all phenomena on the macroscopic level, with electromagnetism, which describes the behaviour of subatomic particles. It is said that Einstein dedicated the rest of his life, unsuccessfully, to unifying relativity and quantum theory. Inspired by Einstein's effort, other Physicists developed a new model called "string theory" during the 1960s and 1980s. Describing the meaning of string theory, Becker et al. [10] observe that string theory rose because of the attempt to understand the strong, unclear force that is responsible for holding protons and neutrons inside the nucleus of an atom, as well as quarks inside the protons and the nucleus. It is intended to be used for the ambitious purpose of constructing a theory that unifies general relativity (gravity), which deals with the macro realm of the observable, and quantum mechanics, which deals with the micro realm of the non-observable or very small. The goal of string theory is to present a unified theory that explains all the fundamental laws of nature. The string theory will then assuage Einstein's fear that quantum mechanics is incomplete because it seems to contain the possibility of a causality violating action- at- a- distance. However, the success of string theory is limited because the theory has not been satisfactorily corroborated and because there are up to five competing string theories. To remedy the second limitation of string theory, Physicists have developed M-theory, intended to unify all existing string theories in 11 dimensions.

3.4. A Philosophical Scrutiny of the Trajectory of Mechanics from the Ancient to the Contemporary Era

The gradual evolution of mechanics from the ancient to the contemporary calls for an insightful philosophical scrutiny of its dynamics. Here, researchers provide you with the scrutiny needed to unravel the deeper implications of this trajectory.

Metaphysics/Mysticism Cum Science Curvature: The development of mechanics projects a trajectory from the ancient Aristotelian supernaturally determined universe through the modern Newtonian mechanically determined (clock-like) universe to a contemporary interlude of uncertainty and a final consummation in a notorious unification of the determinable and the indeterminable in the M-theory. In this framework, the Germanic wall that separated the scientific realm of strict precision and determination breaks down to accommodate the metaphysical and mystical realm of unpredictability, imprecision and unobservability. The emerging and prevailing universe is no longer that of demarcation between science and non-science, but that of metaphysics/mysticism cum science curvature, where precision meets imprecision, determination folds into indetermination, certainty synchronises with uncertainty, the physical is assimilated by the spiritual, and the spiritual is penetrated by the physical. This universe is no longer the Einsteinian universe of space-time curvature but that of metaphysics-science curvature and interpretation. This ultimately vindicates the African worldview of extraordinary interpretation between the physical and the spiritual, which Western and allied thinkers demonise.

The Demise of the Kantian Phenomena/Noumena Dualism and The Rejuvenation of the Berkeleyan Subjective Idealism: The Kantian worldview of demarcation between the experiential phenomenal world and the ideal antimonial noumena created an objective world independent of the mind, upon which man imposes his rational categories to comprehend. This Kantian objective realism diffuses with the emergence of the observation-created quantum reality. Thus, the subjective idealism of Berkeley, in which observed realities are essentially mind-dependent and devoid of objective existence, has re-emerged.

Causality Becomes a Quantum Causality and Gives Birth to the Spurious Action-At-A-Distance: The indeterminacy, probability, and uncertainty principles of quantum mechanics state that researchers cannot simultaneously predict the position and momentum of subatomic particles, which constitute the irreducible elements from which the macro-world is constructed. By virtue of serving as the building blocks of macro phenomena, the macro world is ipso facto imbued with the same attributes of indeterminacy, uncertainty, and probability. Mechanical cause and effect relationship is not, therefore, absolutely tenable even in the macro world since it is an offshoot of the indeterminable micro-particles. This implies that the spurious distance-that is, unmediated action, which holds at the subatomic realm where space and time collapse, is possible in the macro-realm. Hence, causality, action mediation between objects, becomes the casualty of quantum mechanics since determinism between cause and effect no longer holds.

Possible Manifestation of the Apocalyptic Eschatology: The present state of the breaking down of disciplinary boundaries, with its resultant crisis of disciplinary relevance sequel to the inevitable compulsive unification of all realms of knowledge seem to bring the universe closer to the brink whereby in the fullness of time, as prophesied in the Scriptures, there will be an apocalyptic cataclysm preluding the grand eschatological end. At this juncture, knowledge will reunite with its universal author, and the universe will return to its author.

4. Conclusion

Our discussion of quantum mechanics took us on a historical journey through the development of mechanics, from its early beginnings to its modern forms. One of the most interesting things that has happened along this path is that the idea of mobility has changed. Both ancient Aristotelian mechanics and contemporary Newtonian mechanics regarded motion as a deterministic, foreseeable process, governed by explicit causal laws. Quantum mechanics, on the other hand, turns this long-held belief on its head by adding chance, indeterminacy, and uncertainty to the basic description of physical reality. In this regard, quantum physics presents a significant challenge—indeed, a devastating blow—to the foundational concepts of both ancient and contemporary mechanical paradigms. This change in thinking made many scientists uneasy, especially Einstein, who famously disagreed with the idea that nature is dominated by randomness. Confronted with the undeniable data substantiating quantum theory, Einstein and his contemporaries endeavoured to establish a more profound framework that could harmonise the probabilistic nature of the quantum domain with the deterministic, observable macroscopic world. Their work led to the creation of the unified field theory, which sought to combine gravity and electromagnetism. Later, it led to the creation of string theory and its modern extension, M-theory. A meticulous examination of this evolution—encompassing Aristotelian natural motion, Newtonian principles, quantum indeterminacy, and modern unification efforts—unveils significant philosophical ramifications. One significant consequence is the eventual substitution of Einstein's concept of space-time curvature with a nascent metaphysical-scientific framework in which ontology and physics progressively converge. Knowledge seems to have moved from terminus a quo privation, a place of fragmentation, disunity, and incomplete ideas, to terminus ad quem perfection, a place of greater unity, integration, and theoretical completeness. The evolution of mechanics signifies not only scientific progress but also a profound epistemological and metaphysical revolution in humanity's pursuit of understanding reality.

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