IN LIGHT OF PHYSICS

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Introduction

Rene Descartes philosophized, “I think, therefore I am . . . . If I am deceived of my existence, then I must at least be the Deceiver.” He therefore confirmed his existence as a fact of observational by way of his own awareness of himself.

Am I alone?

If something counteracts my thoughts and actions, as to cause either pain or pleasure, then there is an objective world about me. I am not alone. We therefore exist.

I am witness to existence, but I do not know how even a state of consciousness is possible unless I am all knowing and in denial of it. I therefore assume we are only parts of creation, as either by way of a Supreme Being or from what already exist.

Can something exist without awareness of it? Never mind. What does it matter? This book is about the physical world in which we live. The mind-matter duality is not here a concern.

I further perceive of my physical existence as comprised of a substance that exists in space and time. This substance seems to vary in shape, size and quality, but philosophers throughout history have attempted to explain everything that exists in the physical world as part of a primary substance that became referred to as the aether.

Assume all physical existence in our world is indeed comprised of this aether. What, then, can we further determine with regard to its fundamental properties? Being primary, as with no internal force to hold it together, it would seem it could only move through space as nothing more than a flux that collides, separates and combines into various forms from an otherwise formless existence. However, it must also somehow be intrinsically elastic. If to the contrary it is not, then all motion of interaction cancels out.

The primary substance must be elastic for it to interact and still maintain motion in the universe. By similar reasoning, the aether is infinite in amount, as contained within an infinite amount of space where it is not allowed to fly apart to where it would never have the means to turn around and come back to interact with itself.

Another question we can ask is whether all of space is filled with aether or only partly filled with it.

Descartes and other philosophers assumed space is a plenum, as to be completely filled with a substance. How, then, are various densities possible of ordinary matter that is essentially comprised of the aether, which is everywhere the same in composition? Light waves propagating through a denser medium of water, glass or air, for instance, appear slower than they do in vacuum space, as with regard to the all pervasive aether that is invisible to us.

No wonder the early Greeks regarded our world as illusionary. As for the plenum, they conceived of circular motion in it as only possible. By way of circular motion and elasticity (as to constitute conservation of energy) the aether thus moves unimpeded through space.

Descartes assumed the aether, as by way of its circular motion, forms vortexes and vortices of different sizes and rotational speeds. They rotate separately, but they also contain other vortices inside themselves that they exchange with other vortices, and so on, with endless possibilities. The number of either same size or different size vortices in one region of space can thus be denser than those in another region of space. Since the overall density of the primary substance is still the same everywhere in space, the objective world we experience somehow comes about from how the vortices in the aether interact with each other.

All creation is therefore explained as something already created out of what already existed in another form ad infinitum. It continues to create relative effects by way of maintaining circular motion.

Ways to Explain Nature

Some things we cannot explain; others we can, but whose existence we cannot prove. We cannot, for instance, explain the existence of the aether, if there is indeed a primary substance from which all things form, but we can use it to explain how constant light speed is possible. One explanation of it, in fact, was provided by Hendrik Antoon Lorentz, a 19th century physicist. According to him the internal movement and lengths of objects are altered by their motion through the aether, but measuring rods and clocks are also affected by their motion through the aether. How we determine the space and time coordinates of other systems thus depends on how they and the apparatus used to determine them are affected by their motion in the aether. As it turns out, a unique cancellation of effects occurs such that measurements are the same whether it is the object of measurement or the measuring apparatus that moves through the aether. In effect, the absolute state of rest in which the aether is assumed to reside becomes indeterminate. The aether as an object of measurement is therefore invisible to us.

The aether was rejected because physics only pertains to the observable world in which we live. Because we perceive it by way of light, and because light speed was determined by experiment to be the same to all observers, whereas space and time coordinates are not, Einstein postulated, as without explanation, the constant speed of light as a fact of nature. He then formulated his theory of special relativity to describe the space, time and motion of physical events accordingly.

The perception of our world is thus by way of light, or, at least, as consistent with its constancy as an absolute way of measuring space and time. However, it was also determined that light moving in a gravitational field differs from its movement in gravitational free space. Further modification of theory was thus required.

By special relativity, all observers in relative motion compare events by way of constant light speed. In general relativity, the path of light is also conditional. If the presence of mass warps space, such that the path of light is curved, then space is therefore curved as well. Special relativity is thus modified to comply with space-time curvature, which is verified by observing an optical displacement of stars from light passing by the sun during a solar eclipse.

By the same reasoning that we perceive the world in which we live is according to constant light speed, Einstein further explained gravity as space-time curvature caused by the presence of mass. In contrast, explaining constant light speed by way of the aether refers to nothing observable.

The aether still played a historical role in the development of theory. It allowed a wave theory of light to develop, as required by a medium in matter-free-space in which to propagate. Later, matter was also shown to possess wave-like properties, further indicating the presence of a medium of some sort. However, both matter and light were also detected as discreet units of particle-like energy. A theory of quantum waves developed. Although it is a fundamental part of modern theory, physicists decided instead to interpret the wave equations as probability equations.

The particle-wave duality continues to this day. Milo Wolff, for instance, proposes to explain all physical phenomena, including gravity, according to his wave structure of matter. To the contrary, Lyndon Ashmore contends particles are the natural world's primary ingredients.

Ashmore belongs to a special field of physics called plasma cosmology. Plasma is studied in the laboratory and the results are applied to explain electromagnetic effects generated by Earth, the other planets, the sun, the solar system, the galaxies, and so on. This method is similar Einstein's postulating constant light speed as a fact of nature, as verified by all experiments, in order to formulate his theory of special relativity. However, most physicists disregard plasma cosmology and consider big bang as the correct theory.

Ashmore proposes a tired light theory in place of a big bang one in order to explain the red shift in the light spectrum of starlight from more distant sources. Light from relatively receding objects is weakened similar to the way a bullet has minimal impact on a target moving away from the rifle at nearly the same speed at which the bullet moves. The weaker light is shifted towards the red end of the light spectrum. Starlight is also seen to be red shifted to a degree in proportion to the distance of its source from us, which suggests the universe expands outward. However, instead of attributing the red shift in starlight to a recession of the stars, Ashmore assumes part of light's energy is absorbed in intergalactic space by the electrons of the plasma.

Wolff assumes all phenomena are explainable by way of wave action. Gravity, for instance, results because there is a decrease in amplitudes of standing waves between wave centers of mass. (The wave centers, however they manifest as such, are perceived by us as mass.) The greater the mass of wave centers and the shorter is the distance between them the greater are the amount of standing waves between them. The decrease in the amplitudes of the waves compensates for the increase in their wave-density.

Wolff's theory also opposes the big bang one. Its explanation of gravity is similar to Einstein's warping of space due to the presence of mass, and it is predicated on the principle of simplicity. A more detailed explanation of how a decrease in wave amplitudes causes gravity could challenge its simplicity, but neither is the warping of space due to the presence of mass explained in intricate detail. The practical worth of Wolff's theory, as does Einstein's theory, depends on it being able to predict new results.

But whether Milo's wave theory of matter, Ashmore's tired light theory, or big bang cosmology is correct, it is not for this book to decide. It aims only to examine assumptions in an attempt to better understand the historical and mathematical development of theory from a metaphysical perspective. Since the aether is a part of this history, it is a way to understand the physics apart from the physics itself.

Challenging Assumptions

Einstein later suggested the aether could be used as a means to better understand theory, but most of his colleagues trumped his suggestion. This book agrees with Einstein. As the aether indeed played a historical role in the development of modern theory, it can provide a better understanding of theory as well. Even though there can only be a metaphysical explanation at best, the metaphysics is still useful for explaining the physics.

Modern theory also builds on assumptions that are subject to challenge. Challenging them could lead to a better understanding of theory in general, as to help advance theory, as for it to lead to new discoveries.

Physics has developed by way of challenging assumptions that had been decreed indisputable. Einstein challenged the concepts of absolute space and absolute time that Newton had assumed to be obvious. As a result, Einstein's theory of relativity, wherefore space and time are relative instead of absolutes, superseded Newtonian Mechanics, which had reigned supreme for centuries.

Theories are based on one assumption or another that is either true or false. In some cases false assumptions even lead to correct outcomes. Newtonian Mechanics is still used for space exploration even though the math involved in the predictions is formulated according to the incorrect concepts of absolute space and absolute time. Although Einstein's more accurate theory of relativity replaces the concepts of absolute time and absolute space with the concept of relative space-time, as to how its observation is determined by light, Newton's theory proves to be accurate enough and simpler to use to guide spacecraft through our solar system.

Crucial to the truthfulness of theory is still the assumptions on which it is based. Laws of nature, for instance, are integral parts of modern physics, but they are assumptions just the same. What distinguishes them apart from other assumptions is that they are firmly founded on observational fact.

Some laws are more firmly established by experiment than are others. The constant nature of light speed is one. The equivalence of inertial and gravitational mass, which is the founding principle of Einstein's general relativity, is another. A somewhat less accepted theory is big bang cosmology. It is accepted by most physicists as established truth, but its founding assumptions are still opposed by plasma and other cosmologists.

Big Bang Cosmology

Is time finite or infinite? What happened first? What occurred before it? What caused the big bang, and so on?

Is space and matter infinite in extent? What entity of our world is farthest from us? What entity lies beyond the farthest?

Whether we live in a finite or infinite world, we seem only able to comprehend the finite. Moreover, each entity of our world seems to forever change, as to have a beginning and an end to existence. A theory such as the big bang one whereby the whole universe has a source of creation and then fades out of existence is therefore not inconsistent with how its internal parts operate.

Big bang cosmology for the most part is shown to be consistent with established theory and with observation. As already indicated, the theory agrees with the red shift in starlight from the more distant stars. Olber's paradox is also resolved by it insofar as there are not an infinite number of stars in a finite universe to prevent the night sky from being dark. According to big bang advocates, it predicted the existence and temperature of a background radiation moving evenly every which way in space, as created by the big bang before the universe cooled enough for the formation of matter. Moreover, more recent observations indicate the cosmic background radiation continues to cool, as expected of an expanding universe.

Big bang cosmology is also formulated in a manner consistent with Einstein's theory of general relativity. This consistency is with regard to two solutions of Einstein's general field equations. One solution is a metric derived by Karl Schwartzschild that indicates a singularity, which became the basis of black hole theory, and which also provided the convenient source for the big bang's creation. The other solution of the field equations is a metric that was derived by Alexander Friedmann. Space-time according to it either expands or contracts, such as to result in an unstable universe instead of a static one, as Einstein and other physicists had assumed it is.

Relativity theory essentially describes the conditions of space, time and motion according to what influences them, and a metric is what compares the distances and times of one set of coordinates to those of another. Since mass and energy warp space, Einstein's general field equations contain conditions of pressure and density, and these conditions further allow for a cosmological equation of state. Friedmann further assumed the conditions apply on a large scale in analogy to an ideal gas. On a small scale, as within Earth's immediate surroundings, they differ, but differences even out within volumes of space billions of miles in diameter.

To describe the expansion of space for an expanding universe, Lemaitre, Robertson and Walker further developed the Friedmann metric, which is now referred to as the FLRW metric. It includes the singularity and a Cosmological Principle whereby the universe is assumed on a large scale to be homogeneous and isotropic, as to appear the same in all directions.

The FLRW metric is also time dependent, and since light takes more time to reach us from a farther distance, the theory provides a means to discover how the universe involved from the beginning of time. It takes the universe back to a singularity where the laws of physics no longer apply. Big bang cosmology therefore proposes a creative beginning to the universe.

Big Bang Challenged

Assumptions, assumptions and more assumptions: as space is assumed to somehow expand from a singularity, as a tiny speck so to speak, why not assume something exploded before the creation of matter for its creation? If the universe does not contain enough matter to satisfy the conditions of the theory, why not assume dark energy exists in order for the cosmic rate of expansion to increase in time along with a decrease in gravitational strength of the less dense observable mass?

Big bang theory is accepted by most physicists as agreeing with other established theory and with observation, but it is still challenged by a small minority of physicists. To them, for instance, the temperature of the cosmic background radiation was not an exact prediction by theory; the theory was corrected after the fact, as *ad hoc*, in order to comply with observation. Was the original form of the theory maintained in its mathematical correction or were conditions changed for the theory to better comply with the facts? Its proponents claim the former as true; critics propose otherwise. For a more objective evaluation, examination of its history in more detail is required.

As for the decrease in cosmic temperature of background radiation, it is claimed by critics to be a local decrease along with a depletion of mass and energy of our Milky Way galaxy.

Plasma cosmologists propose a ‘tired light’ theory to explain a red shift in the light spectrum from more distant sources. The space between galaxies is not empty; it contains plasma of electrons absorbing energy from the light passing through them. Since red light is weaker than blue light, the shift to the red end of the spectrum from more distant sources is thereby explained. As light from more distant sources fades out of view, Olber’s paradox is also resolved.

As for the FLRW metric, it is essentially about the expansion of space-time instead of what expands in it. Since in relativity theory light determines how we perceive space and time, why can it not relatively expand from the depletion of light energy moving through it? If it can, then tired light could then be shown to be consistent with general relativity as well.

But consistency of theories with general relativity is not enough to decide which one is correct. How they agree in general with the laws of nature is a more comprehensible test of theory, as a way to understand its merits by way of a historical perspective.

One law to consider, for instance, is entropy. It is the amount of energy an isolated system has that is unavailable for internal work on the system, as for self-change.

Let an isolated system consist of two rocks relatively at rest in space. If they are of the same temperature, heat energy from one rock cannot perform work on the other. This useless energy is entropy.

Entropy is the amount of energy an isolated system has that is unable to do mechanical work on the system. It has also been defined as the amount of disorder a system has. Disorder does not produce work, as with an equilibrium state of temperature, because the random motion of the molecules producing heat work against each other to produce no external effects. Order is thus required to produce work. Two systems at different temperatures, for instance, are orderly inasmuch as the molecules of one system rush towards the other system. In so doing, the heat of the molecules converts to wind energy that produces mechanical work on other systems.

A statistical interpretation of entropy was proposed by Ludwig Boltzmann in 1877. It assumes all systems tend towards their most probable state of order, which is an irreversible state of equilibrium that constitutes maximum entropy. Later, boundaries were added to allow entropy to increase with expansion. As the universe expands, for instance, it tends towards a heat death. However, although this result is consistent with an increase in entropy, the heat death also constitutes a decrease in energy in contradiction to conservation of energy, the first law of thermodynamics that states energy is neither created nor destroyed.

By the laws of thermodynamics, energy is neither created nor destroyed, and the entropy of an isolated system cannot decrease on its own accord. To be consistent with these laws, the energy from the big bang must have preexisted. If so, did entropy decrease by way of the explosion, as to perform work in its creation of light, stars and particles of matter? Maybe the entropy increased by way of the universe expanding compensates for the entropy decreased from the explosion.

But observations of the recessive rate of more distant stars in the past indicate the universe expanded at a lesser rate in the past. Big bang theory has thus been modified with the inclusion of dark energy to explain the increase in the rate of expansion. If such dark energy does exist, then perhaps entropy is conserved as well as is energy, as to have been set at the beginning for continual balance of expansion and explosion.

By another interpretation of the second law of thermodynamics there is no such thing as a perpetual motion machine. However, the previous analysis of entropy and the law of conservation of energy suggest the universe itself is a perpetual motion machine.

As to the law of entropy we may ask: How does entropy apply to an infinite universe not to be able to expand because it is already of maximum size?

The answer to this question depends on whether the most probable state of existence for the universe to be in is a heat death or a recycling state. As indicated above, the universe could be in a dynamic state of equilibrium, as in the same sense that motion is conserved. The gravity of a star, for instance, causes pressure and generates heat. By emitting light the system expands. But gravity also attracts matter to bring it together to create more pressure. It is also possible that, on the large scale, the random motion of the molecules in thermodynamic equilibrium could rearrange in such a way as to become unbalanced. On a large scale, then, the universe could very well be recycling in a manner consistent with a steady state cosmology.

Clearing a Path of Knowledge

I think. I am therefore a thinker. I think I want to understand the physical world in which I live. I thus study the history of physics as a path to knowledge. To learn of the past educates me on how we know what we now know, and it prepares me on how knowledge could advance in the future.

The path of history has become a superhighway with many followers. Most of the scenery appears bright, but because some of it remains in doubt, I branch out from the main road, which is the establishment, to find out how it appears from a different point of view, as even from one of metaphysics.

This is a different perspective that lies outside the mainstream of thought, as to venture into metaphysics, but the subject matter is still physics, and modern theory is mathematical. Although I can skip most of the mathematics to only understand the concept of theory, mathematical detail provides verification.

Mathematics also helps us understand the metaphysics of the physics. It is, for instance, one thing to simply claim the constant nature of light speed is explainable by way of the aether affecting clocks and measuring apparatus in a unique manner as they move through it, but a mathematic verification of the explanation is more convincing.

This book is more about examining assumptions and exploring their possibilities. Big bang theory might be true, whereas the tired light one might lead to a dead end, but I see no dead end in sight. Likewise, black holes might truly exist, but there is another way to explain the observations of their existence such that the boundary condition of the Schwartzschild metric turns out to be only a limiting aspect of relative mass densities that are unobtainable in a manner similar to the way matter is unable to reach the speed of light. In effect, the black hole is only a quasi black hole.

My venture away from the establishment corresponds with the viewpoint of Albert Einstein. He once suggested the concept of the aether can be a way of understanding the constant nature of light speed. He further argued against the singularity. Big bang theory, which includes the singularity, is also in doubt.

My path has linked up with those of Milo Wolff and Lyndon Ashmore, but I merely explore the underlying assumptions in order to determine where they will lead me.

By exploring these paths we might find a universe that is finite as an observable part of an infinite one that is mostly unobservable to us.