PART – A1: An Introduction to Grand Unification.

Throughout human history, the designated arbiters of scientific knowledge have been the persons who espouse perceived truths that are deemed, by mankind, to be foundational, empirical, concrete, rigid, fundamental and immutable across all fields of science. Consequently, at the turn of the twentieth century, Sir Albert Einstein was bestowed the honour of being one of the most important arbiters of mankind's scientific knowledge, as his purely conceptual works of General Relativity, Special Relativity, and Quantum Mechanics caused a fundamental change in mankind's overall perception of the physical nature of the material universe. In essence, Einstein's ability to think outside of the box, whilst still staying true to the foundations of the scientific method, enabled him to develop theoretical works, or scientific works, that were very comprehensive and well thought out, or that were testable or verifiable through use of physical experiments and observations; and this encouraged many in the scientific community, to embark on a journey to test, validate and examine, the compatibility, rigidity, consistency, accuracy, and coherency of the concepts and models that were developed by Einstein. However, this approach did not only serve to validate the accuracy of many of Einstein's predictions and models, but it also revealed that some of Einstein's most famous theories were fundamentally incompatible with each other. Consequently, there are now entire fields of science that focus predominantly on the mysteries and puzzles linked to the differential equations and models left by Einstein; and one of the more prominent examples of this is the field of String Theory, which was first proposed in the 1960's as a purely mathematics based endeavour, and has prioritized the studying of Einstein's equations above all others. In that same vein, the fields of Modern Particle Physics and Modern Cosmology, which mainly involves the use of very advanced physical tools such as the large Hadron Collider and the Hubble Telescope, have also prioritized the studying of Einstein's models, in an attempt to ascertain how these models could, eventually, influence the future path of the Standard Model. As the general consensus throughout the scientific community is that the universe speaks predominantly through mathematics or mathematical patterns and numbers. However, as several decades have elapsed, it is quite clear that the scientific community has been incapable of producing or attaining any useful conceptual solutions, or any meaningful physical or tangible solutions, to the mysteries and puzzles connected to Einstein's works (or to the inherent incompatibilities that exist amongst some of Einstein's models; especially, the conflicts between Quantum Mechanics and Relativity). Therefore, this continued failure is, perhaps, an indication that the single-minded focus that the scientific community currently has, on the complex mathematics contained within the equations and models developed by Einstein, might be the wrong approach, and, perhaps, the correct approach should be to focus in Einstein's use of thought experiments, or to identify the deeper points and thought processes, attributed to Einstein, or hidden within his conceptual works, that aided him in the development and dissemination of his models.

Consequently, a concerted effort should be made by the scientific community to emphasize, acknowledge, and evaluate the important roles that thought experiments reliably played in Einstein's works; and as such, any scientific approach that is designed to find a resolution to the conflicts that exist amongst Einstein's models, should first account for the dichotomies that exist amongst thought experiments, conceptual equations, and real physical experiments (or physical observations), as these were the distinct dichotomies that were consistently revealed throughout Einstein's works; where his goal was to connect the simple language or the simple idioms of his thought experiments, which contained his initial ideas and insights, to the mathematical rigidity and replicability of his differential equations. So, as Einstein attempted to complete some of his most famous works, he circumvented most of his usual reliance on real physical experiments (or physical observations), and instead relied on cleverly designed mathematical probabilities (or quantum

notions derived from a specific set of thought experiments) to, in a purely conceptual way, explain most of the properties connected to subatomic entities such as photons and electrons; and in a similar way, he utilized mathematical equations (or relativistic notions derived from yet another set of thought experiments) to explain gravity (or the gravitational effects that seem to be at play in all galaxies, or star systems, across the observable universe). Thus, as Einstein sought to refine the initial set of ideas that would later become Special Relativity, he deployed thought experiments that involved moving trains, and flashes of lightning, to explain some of his most penetrating insights, both, to himself and to others; and for general relativity he deployed a series of imaginary scenarios, cognitive exercises, or thought experiments that related to accelerating elevators, persons falling off roofs, and blind beetles crawling on various curved surfaces, to reveal or describe some of the important or profound, but somewhat unintuitive, insights into his theory. Hence, as he sought to reconcile his life's goal, which was to unify the incompatible theories of relativity and quantum mechanics to attain a single theory that could explain how the universe works, Einstein viewed thought experiments as one of the more reliable, precursory means through which he could properly conceptualize or grasp his own initial concepts, and as a means through which he could properly elucidate or inculcate his finished or polished ideas to himself and to others. So, in Einstein's eyes both thought experiments and equations were simply tools, or components, that resided partly in the precursory stage of the scientific method, and this means that the route that mankind could actively seek to traverse to gain more insight into the overall physical nature of the material universe, or to resolve the lack of homogeneity that exist amongst Einstein's models, is, perhaps, connected to the principle that, at their respective cores, all of Einstein's theories were built on the backs of cleverly designed thought experiments. Therefore, a unified model attained through the use of mainly thought experiments would not be an ideological shift, instead it would coincide directly with Einstein's own past approaches, and would simply be the intentional highlighting of a specific part or aspect of the scientific method; and all the necessary strategies and methodologies tied to the use of complex equations, complex mathematical notations, and complex geometry, or to the systematic use of physical experimentations, observations, measurements, formulations, and tests, relative to some specific set of conditions or hypotheses, could still be developed and deployed at a later time.

But, Einstein's approach which places great emphasis on the assumptions contained within a specific set of conceptual equations, or the inferred solutions to those equations, happens to be too abstract and numerical, and thus, neglects one of the more significant properties of the material universe, which is its ability to facilitate the sustained creation or emergence of, not just protons, atoms, planets, stars and galaxies, but living entities, as well. Consequently, given that living organisms, which are not defined by any known equations, are also a significant part of the universe, any model that hopes to reveal the inner workings of the universe would also be required to reveal not just the creation, functions and properties of protons, atoms, planets, galaxies and stars, but importantly would also be required to reveal the creation or emergence of life in the universe, as well. Thus, the incompatibility between the theories of relativity and quantum mechanics may stem, not from calculations about gravity or incorrect equations, but from the principle that both theories fail to account for some of the key components of the universe, one of which is the significance of processes that created life in the universe. So, to truly gain more insight into the fundamental nature of the universe, mankind might have to: Utilize thought experiments as the unique precursory scientific tools they were meant to be, and use them, instead of equations, to create a series, or web, of interconnected visualized scenarios that can be expressed in, purely, broad non-mathematical terms, or in plain descriptive language, to fully define, describe and catalogue the basic structures, processes and objects that are at work, specifically, in the biology of mother nature, in the chemistry of the surface of the earth, and in the physics of the broader universe; instead of, continuously, trying to use equations as the main reference points for the analysis of selective

telescopic data (or for the analysis of other selective physical observations and statistical models) that, specifically, pertains to certain objects and processes, whose true physical structures or components are unknown, and, thus, can only be depicted as the very opinionated rendering, or impression, of artists, computer programs, and computer simulations. In other words, given the scientific community's current lack of success, in its many attempts to unify the various series of complex differential equations (or the numerous constants and infinities in a vast number of non-Euclidean geometric models), which were devised independently of each other; and, given the many shortcomings of the scientific community's continuous attempts to conduct ever larger physical experiments that, still, can only simulate or mimic, for a few nanoseconds, a very small fraction of what is assumed to be the true physical powers, temperatures, and pressures of objects such as the sun and other stars; perhaps, the goal should be to, simply, use thought experiments, in a purely conceptual way, or as the proxies they were meant to be, and use them to tell new versions of the story of the Earth, and to hypothesize about the past, present and future of the broader physical universe. Therefore, within this new or somewhat unconventional approach, the scientific community would circumvent its usual reliance on the types of physical experiments that are beholden to the perimeters of conceptual equations; and would, instead, focus its attention on the utilization of a coherent set of wide-reaching thought experiments, that can be used to attain a cohesive interconnected set of ideas, that can actively pull insights from all fields of science, instead, of only pulling insights from fields that are narrowly based on, or limited by, the assumptions consolidated within an arbitrary set of numeric symbols, that have been manifested from a multiplicity of incompatible or incomplete conceptual equations, or that have been conjured up from an amalgamation of conflicting (or entirely unconnected) thought experiments, hypothetical situations, and abstract scenarios.

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