> If from space and time we should take away the concept of the absolute, this does not mean that the absolute is thereby banished out of existence, but rather that it is referred back to something more fundamental.
>
> —Max Planck, *Where is Science Going?*

Introduction

How could science be different? The question invites consideration of science's present state. As with all intellectual endeavors, science follows its successes, and since Newton, no scientific theory has been more quantitatively successful than the Standard Model of particle physics. Notwithstanding, there remain foundational phenomena—such as dark matter and dark energy—for which the Standard Model provides no satisfactory resolution. The prevailing assumption is that insight into these open questions will come through the full expression of quantum field theory in rigorous mathematical terms; but thus far, this project has been riddled with infinite difficulties. Perhaps, though, the true obstacle lies in the presumption that a remedy will stem from math, diverting eyes from other options. Could genuinely new ideas come from an unexpected quarter, from another discipline? Is this a way in which science could become different?

What follows is a thought experiment, a deductive attempt to describe the physical universe from the vantage of ontology—a venture that begins with axioms educed from the philosophical canon, that delineates a self-consistent conceptual framework to depict the system, and that ends in a proposition on the origin of life. Along the way, fresh perspectives on persistent, unsolved matters are suggested, hinting at the possibility of a very different future course for science.

Conceptual Framework

Let's start with the ontological assertion that there are two fundamental functions at work in the Universe: (1) new objects are being generated and (2) existing objects are being sustained. The former, we will call *emergence*; and the latter, *existence*. We can think of these as rather opposing functions since new objects are created by reconfiguring existing objects. In this sense, then, a free electron that bonds with a proton to form a hydrogen atom is no longer what it used to be: a free electron. In other words, let us assume for the sake of this line of argument that the free electron is ontologically different from the bound electron in a hydrogen atom. And if there is an ontological difference, then there should be a measurable property that corresponds to this difference—that is, if philosophy is to inform physics.

What is the nature of this measurable property? Before we address this question, let us consider the two functions submitted above: emergence and existence. When it comes to emergence, the Standard Model provides a remarkably accurate and precise material understanding of how particles and (therefrom) composite objects come-to-be; we affirm without condition its efficacy. However, once an object comes-to-be, there are (we contend) processes that work to temporally sustain the object's existence against the forces which would—in furthering emergence—lead to its rapid demise. At this point, we must supplement our field-dependent description of the Universe with an object-dependent description of the Universe, but we can only logically make such an addendum to theory if we accept that there are two distinct and oppositional functions at work in the system: existence and emergence, or what philosophers have called *being* and *becoming*.

Back to the question: what is the nature of the measurable property that would ontologically distinguish a free electron from a bound electron and contribute to its ongoing existence? To begin, let's examine the predominant mechanism of emergence: the conjoining of objects. Because new objects are primarily formed by joining existing objects, it follows that the principal condition which will enable an object to keep being 'what it is' is ***space from other objects***. Therefore, let us assume that when an object comes-to-be, it concurrently generates a surrounding *boundary energy* which works to ensure some degree of separation from other objects in order to protect its continuing existence, as is roughly depicted below:

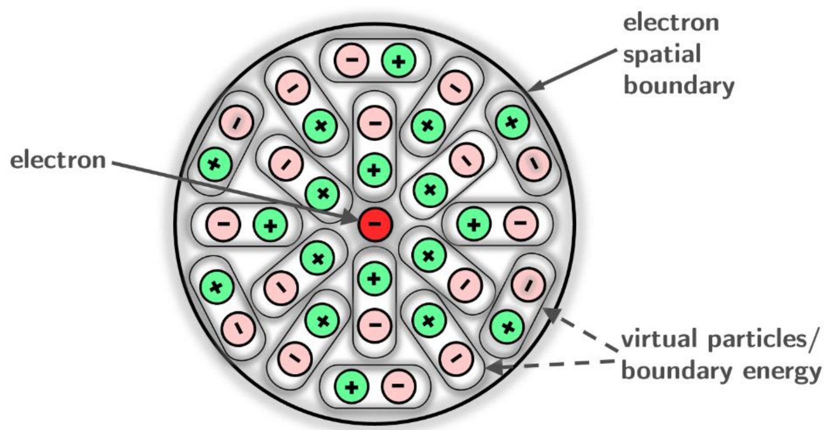

Figure 1: Electron with boundary energy

Here, we are introducing no new particles nor proffering principles that clash with observation. Rather, we reconsider the accepted proposition that virtual particles are quantum fluctuations in an underlying field and suggest instead that virtual particles are object-dependent, serving to provide a buffer from other objects, a spatial boundary, as it were. Additionally, we assert that the energy from virtual particles in an object's spatial boundary is delimited and determinable. Part of this energy is intrinsically determined by the object's mass and charge. Part of this energy is relatively determined by its momentum—for the greater an object's momentum, the less imperiled it is by proximity to other objects. To phrase the preceding precept even more plainly: the faster an object moves, the more likely it is to remain free. Accordingly, we can think of the free electron as needing a certain amount of space in the system (based on its mass, charge, and momentum) to maintain its autonomy, and this manifests as its boundary energy.

What happens to this energy when the electron bonds with a proton, when it loses its ontological autonomy? The electron continues to need space, for it does not cease being an object, but it is now an object-within-an-object; at this point, the composed object (i.e., the atom) has *ontological standing* within the system. As a consequence, the electron retains part of this boundary energy to sustain its spatial demarcation from the proton, but the greatest portion of the energy is returned to the system, utilized to facilitate the emergence and existence of other objects.

In fact, we find it helpful to characterize this operation in aphoristic terms: the space belongs to the object, but the energy belongs to the system.

As to the spatial demarcation of the electron from the proton in a hydrogen atom: this is confirmed through observation as the Lamb shift. Currently, this shift is explained by theorizing that the electron is interacting with the vacuum energy of empty space. However, an alternate way to interpret the shift is to regard it as being caused by the ontological status of the electron in relation to the proton in the hydrogen atom; the energy works to counteract the binding forces which draw them together, shifting the electron's position distribution away from the nucleus. Furthermore, this energy varies between the *s* state and the *p* state because angular momentum contributes to object-differentiation in the *p* state. The larger point: yes, present theory has an explanation for this positional shift, but this suggested framework also has an interpretation that conforms with observation—one that does not rely on the philosophical shaky grounds of *nothingness* and, all the more, sheds light on other open questions.

Open Questions

What else may be illuminated by this changed vantage? From the macro perspective, we recast our view of space and the cosmos. Space is not an emptiness in which objects exist. On the contrary, the entirety of space is accounted for by objects and their boundary energies. How is this? We must augment our ideas with the additional supposition that the density of boundary energy is inversely related to the mass of an object: the greater the mass, the less dense the energy from object-dependent virtual particles. Gravity is commensurate with an object's temporal stability and offsets the ontological peril posed by proximal objects; therefore, massive objects like stars and galaxies have very low-density boundary energy, all with multiple overlapping spatial boundaries. The dynamic system works to simultaneously push objects apart (through boundary energy) and pull objects closer (through the fundamental interactions), with the net effect resulting in a stable equilibrium between the opposing functions of existence and emergence.

Let's now turn our attention to cosmological expansion. While "Big Bang" is the common term used to describe the spatial inflation of the early Universe, we know this to have been a constrained expansion, nothing of the explosive force that is often associated with this event in popular understanding. By introducing the idea of object-dependent boundary energy, we may speculate that as objects emerged in the early system their boundary energies were synchronously derived, causing rapid systemic inflation followed by a slowing of expansion as object-specific spatial boundaries were established. As new objects continued to form, they too developed spatial boundaries which caused further expansion and comprehensively dictated the size of the system. Consequently, mathematical rules deduced from these principles could accurately predict the size of the Universe and the rate of expansion at any given point in time—again, owing to the conceptual premise that systemic space is fully accounted for by objects and their boundary energies. Moreover, this framework rests on the parsimonious assumption that the system is closed, with mass-energy correspondingly directed and redirected as objects come-to-be and cease-to-be.

What other open problems may be reimagined through this revised perspective? We see too many to detail in an initial proposal, but to name just a few—

- **The muon's wobble:** The hypothesis that the density of boundary energy is inversely related to an object's mass could help interpret the (not-yet-confirmed-as) anomalous findings of the Muon g-2 Collaboration (Labe, 2022).
- **Baryonic asymmetry:** Theory holds that matter and antimatter were created in equal quantities at the origin of the Universe; and when matter comes into contact with anti-matter, both particles are annihilated. Why, then, did an imbalance of matter over anti-matter result? The key to this problem probably lies in the mere mechanism of "making contact." Assuming that antimatter generates spatial boundary energy the same as matter, thereby pushing other objects away, then the quandary of baryonic asymmetry should be brought into focus. For an appreciable delay in contact (caused by boundary energy) coupled with a discrepancy in decay rates between matter and antimatter (observed as CP violation) credibly demystifies the subsequent disparity.
- **The fine structure constant:** Given that all objects—even objects-within-an-object—require ontological differentiation, we can hypothesize that the fine structure constant denotes a minimum energy needed to spatially differentiate certain objects in the system: specifically, electrons that occupy the same energy level in an atom. In addition, it would be consistent with theory that this "constant" might change through time (as some evidence suggests), for systemic expansion reasonably alters the essential spatial stipulations and relative energy differentials of all objects while object-dependent locality could explain anisotropic variety in observed measurements.

Origin of Life

At last, how does this conceptual framework afford insight into the origin of life? We will attempt to state the argument as simply as possible. There are two ontological classifications for objects: *autonomous* and *heteronomous*. An autonomous object has ontological standing in the system and generates spatial boundary energy that suffices its mass, charge, and momentum (e.g., the free electron). By contrast, a heteronomous object—or an object-within-an-object—has spatial boundary energy determined by its mass, charge, and momentum relative to the other composing objects in the encompassing autonomous object (e.g., the electron in the hydrogen atom).

In most cases of conjunctive emergence, the conjoined objects lose their spatial autonomies due to the overwhelming strength of the fundamental interactions. For example, a free electron that bonds with a free proton to form a hydrogen atom loses its systemic spatial autonomy, as does the proton. But if we can envision a circumstance in which two autonomous objects materially conjoin, each with its ontological autonomy (i.e., spatial boundary energy) intact, then we have a completely new thing within the system: a single autonomous object with the simultaneous capacity to be two autonomous objects. That is to say, it is an object in which the opposing forces of existence and emergence are at effective equilibrium, *being* perfectly balanced against *becoming*—a singular instantiation of the cosmos itself. This, we propose, is the physical origin of life, a proposition supported by the geometric structure of the double helix molecule. The development of life—defined thusly—can be anticipated from the origin of the Universe, from interacting forces and the principle of object-dependent ontological autonomy manifest in spatial energy boundaries.

Of course, there is much more to life than the double-helix molecule. And though space prevents a full exploration of this matter, we can nonetheless offer a few hints concerning some of the implications:

- **The cell:** Nonlife has an energy boundary, but life has a matter boundary: the cell membrane. Referring to the above image: if we replace "electron" with "nucleoid" or "nucleus," and if we replace "electron spatial boundary" with "cell membrane," then we may glimpse the conceptual correlation between life and nonlife in this framework. Hence, the cell wall structure delineates the systemic spatial requirements of a living object.
- **Information:** Paul Davies (2019) has defined life as "matter plus information," which is very efficient terminology to summarize the theoretical foundations of the question. With the advent of life, a novel category of ontological differentiation is introduced: information. Information is neither energy nor matter but a unique and robust object-class within the system. Indeed, it becomes rather difficult to approach adequate description of information without lapsing into philosophical argot—information is 'nonmaterial thingness'; it is *quale qua object*. From this vantage, information overcomes the intrinsic restrictions of circumscribed mass-energy, furthering emergence through the proliferation of new objects (i.e., diverse lifeforms) while minimizing the spatial demands on a closed system.

Conclusion

Trigonometry originated in study of the movement of stars; modern calculus, in the movement of planets. That scientific observation of the Universe will eventually be reconciled through mathematical expression is an unquestioned tenet of intellectual progress. All the same, advancements since the turn of the twentieth century have cast a pall over observation, detaching analysis from the "absolutes" which provide context to perception; in other words, we view through absolutes so as to discern *what* we are observing. Without absolutes, observables blur into sensory data. Space and time were the absolutes that sharpened Newton's eye, but our eye has become cataracted in the absence of absolutes. Even if we (rightly) understand the discursive course of absolutes as an historical narrative whereby today's convictions are displaced by tomorrow's, this does not obviate the centering effect of this process on scientific evolution; this does not dispel the *a priori* from methodological inquiry.

In this essay, we have proposed the ontological absolutes of existence and emergence—of *being* and *becoming*—in an effort to refocus observation. We have proffered a conceptual framework for the Universe that would reorient the theoretical and empirical approach of science such that it could become, undoubtedly, quite different from its current state. But this essay is a philosophical exercise. The consistency and clarity intimated by the presented lens will depend on scientific observation and math to verify its acuity.