

Dear Frank Wilczek:

In your recent interviews by Robert Lawrence Kuhn, when you were asked whether there is a God, you said, "Not yet." To explain what you meant, you pointed to Archaeopteryx, representing the evolutionary transition from dinosaurs to birds, and suggested that human beings are an evolutionary transition to a form of intelligence that can explain everything without any problems. I agree with you about that. But I believe that it is a mistake to believe that the transition depends on AI or genetic engineering in any way. That is how it appears to Darwinists because that is a shallow explanation of the cause of evolutionary change. The transition to which you refer will be caused by a cultural event, one that occurs in science. In fact, it is one that you can help bring about, if you are willing to try thinking outside the mathematical box of physics.

By "mathematical box," I mean a methodological assumption of physics that I call empirical lawism. It holds that the deepest possible empirical knowledge about the natural world is mathematically formulated laws of nature. They can be confirmed and falsified by careful measurements of their predictions. That has been the secret sauce of physics ever since Galileo and Newton. Modern physics is such a tight and nearly complete description of the most basic regularities about change found in the natural world that you deny there are any "ghosts," by which you mean, I believe, anything like mind or God helping determine what happens. You admit that physics may be overlooking some things. But you call them material because you believe that they will be discovered in the laboratory by experiments testing predictions. You insist that they cannot be studied at all, if there are no regularities that depend on them. When asked about what exists at bottom in the physical world, you avoid talking about reductionism. You prefer to think of physics as following Newton's

method of analyzing what is found into simpler things and using their synthesis to explain all the more complex things in found in the world. From gases to brains, they are all constituted by simple entities, and you seem to accept a weak form of emergentism that explains the discoveries of specialized branches of science as ways of describing complex systems that beings like us find useful.

I have tried to convey what you said as fairly as possible, and I hope that you will recognize it. These beliefs are widely shared among physicists, and they are what I mean by beings trapped inside a mathematical box. The basic assumption is that mathematics is known independently of what perception finds in the natural world. That is what you seem to believe because when asked whether mathematics is discovered or invented, you say that mathematicians discover the consequences of axioms, but they invent the axioms—as shown by the discovery of non-Euclidean geometry and its use in general relativity.

I predict that the transition in the evolution of intelligence will begin by discovering that the truth of mathematics is explained by its correspondence to the natural world. That is possible for naturalists because they believe that the natural world is made up of objects in space that exist independently of one another. Thus, instead of taking empirical lawism for granted, they can try basing science on the belief that the natural world is constituted by substances, so they can infer the kinds of substances that constitute the natural world as the best explanation of what Eugene Wigner described in 1959 as the “unreasonable effectiveness” of mathematics in discovering laws of physics. This empirical inference would be confirmed, if postulating those substances enabled them to solve all the puzzles of modern physics.

This is a form of reductionism because by substances, I mean what the pre-Socratics ultimately believed about the nature of the first cause. They assumed that the natural world is constituted by self-subsistent entities with definite ways of existing in themselves as they endure through time, and they expected to explain every thing in the world by showing how it is constituted by them. That would explain not only the kinds of things, but also their existence. Since ontology is the study of existence, I call substances ontological causes. To be sure, the pre-Socratics never agreed about the kinds of substances that constitute the world. But contemporary naturalists can agree because what they find in the natural world includes the mathematically formulated laws that physics has discovered over the past three centuries or so. I predict that they will agree that the best ontological explanation of the truth of mathematics is that the natural world is constituted by two opposite substances: space and matter. This is not the atomism implicit in empirical lawism, but it is the solution to the problems of physics.

In a world constituted by substances, change is constituted by their interaction, so regularities about change can be explained by the power that enables them to interact with one another. The essential natures of space and matter explain why mathematics corresponds to the world because they imply that every regularity generated by their interactions is quantitative. As space exists independently of matter, it has an infinite intrinsic Euclidean geometrical structure, and as matter exists independently of space, it has an intrinsic quantity. So bits of matter that coincide with space have definite quantities, and if naturalists use the geometrical (or spatiotemporal) structures of their correspondence with space to define their species, the regularities generated by their interactions with space are all necessarily quantitative. Thus, mathematics is true because it corresponds to a basic aspect of the natural world. Geometry and

arithmetic (with numbers explained as results of counting things that have an existence that is distinct from all the others, such as units of space and time) is a sufficient foundation for constructing—or, if you will, discovering—all the mathematics used in physics.

Since the problems of modern physics are all ways that what corresponds to its laws cannot be understood, they would be solved if the basic branch of science discovered specific powers that enable interactions of space and matter to generate all the regularities described by laws of physics. We could understand them because we have naturalistic imagination, by which I mean the faculty built into our mammalian brains by which we can picture how objects are related in space, including our own bodies, and predict the consequences of their motion. Since that faculty is what enables us to understand the geometrical structure of space and count distinct entities, it would enable us to understand how interactions of space and matter generate the regularities described by laws of physics.

To see how this is a way of thinking outside the mathematical box of physics, consider how it would explain the probabilistic character of quantum laws. Interactions of space and matter could generate regularities that cannot be described by the mathematics used in physics because equations depend on coordinate systems for their references to the world. Though coordinate systems correspond to the spatial relations that space gives bits of matter, they filter out all effects of matter on the parts of space with which they coincide that alter how space acts on matter. If such an ontological mechanism generated quantum regularities, a causal role of space that mathematics filters out would be the hidden variable in quantum mechanics, and that would explain why quantum laws are probabilistic. Furthermore, the non-locality of entanglement would not be a problem because

space is a substance that inter-acts with all the bits of matter in the universe at the same time.

To be sure, this ontological mechanism is possible only if it is part of an all-inclusive ontological mechanism that explains the regularities described by Einstein's relativity theories. But that is what I describe in the Unification of Physics, the first volume of Naturalistic Reason, a trilogy that I am self-publishing as I send you this message. It describes ontological mechanisms that explain all the laws of physics in quantitative detail, and since that reduces physics to ontology, it overcomes the mathematical disparity between quantum and gravitational physics. It may be incomplete or even incorrect in some ways, but if it is on the right track, it is complete enough to cause the revolution it predicts. No one, to my knowledge, has proposed this way of thinking outside the mathematical box of physics, and I hope it is plausible enough for you to take my argument seriously.

I am encouraged to write you about it because you recognize the possibility that beings like us are just a transition to a more perfect kind of intelligence, and that is what the discovery that space is a substance that interacts with matter will trigger. The second volume of Naturalistic Reason, titled the Unification of Science, shows how the ontological reduction of physics reveals a kind of efficient cause, not recognized by physics, that works together with physical causes in a way that will enable all the specialized sciences to explain completely the regularities they study. That reveals that the overall course of evolution on suitable planets includes a series of inevitable stages that brings about the existence of beings like us, including an explanation of the basic structure of the mammalian brain as a faculty of naturalistic imagination. The third volume, the Unification of Science and Philosophy, shows how consciousness can be explained as part of a world constituted by space and matter and uses an illusion

inherent in it to explain Western civilization as a distinct stage in the evolution of life caused by the exchange of metaphysical arguments (defined as arguments based on the belief that a faculty of rational intuition enables us to know Reality behind Appearance). This scientific discovery about the origin of science turns ontological science into a cognitive power that knows Reality behind Appearance, so I call the trilogy Naturalistic Reason.

You will be skeptical of this prediction because it sounds too good to be true, and since you will wonder about anyone who asks you to consider such an unlikely argument, let me say something about myself and its origin. I have been working on this argument, pretty much on my own, for over 45 years, while teaching philosophy at American University for 30 years and since retiring from teaching over 20 years ago. As a philosopher, I have written this argument with a care that justifies expecting it to stand up under such scrutiny, and I am prepared to defend it on all fronts. My reason for writing you and a few others is to make what I have discovered public. I am about to turn 83, and I believe that it is my duty to tell others about my discoveries because my society has given me the leisure and privilege to enjoy a life spent in such an exceedingly meaningful way.

Even those who believe that it is possible to explain everything will find the prospect of reading a detailed all-inclusive explanation of the natural world in three volumes daunting, so I am offering an easier way of learning more about it. An executive summary of the argument is presented in a short (150 page) book titled *Sapere Aude* that I am also self-publishing now. I am including a free Amazon link to an eBook version of it. (See below.) And there is more information about this argument at [natReason.com](http://natReason.com), including an introduction to the trilogy, a Table of Contents for it, a bookstore, and more information about me. I would be happy to

answer any questions you may have and very grateful to learn about any problems that you think may cast doubt on it. You can reach me personally at [philliphscribner@yahoo.com](mailto:philliphscribner@yahoo.com).