

Pseudoscience and Victor Stenger's Quantum Gods

Mistaken, Misinformed and Misleading

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“The most beautiful thing we can experience is the mysterious. It is the source of all true art and all science. He to whom this emotion is a stranger, who can no longer pause to wonder and stand rapt in awe, is as good as dead: his eyes are closed.”—*Albert Einstein*

Abstract:

*Quantum spirituality—the idea that some aspect of consciousness plays a fundamental role in the universe and that advanced physics should be interpreted as having to some extent already incorporated this principle—has had distinguished representation among both physicists and philosophers. It has generated an upsurge of grassroots enthusiasm because of the widespread sense that science and spirituality, rather than being fundamentally separate or even opposed, are in fact deeply connected and mutually reinforcing. Victor Stenger's purpose in writing *Quantum Gods: Creation, Chaos, and the Search for Cosmic Consciousness* is to “debunk” this idea—but attention to the details shows that it is actually Stenger's arguments that need the debunking.*

Stenger—a retired physicist who is leveraging his scientific background to try to discredit anything and everything that smacks of spirituality—doesn't respect his intellectual opponents enough to get their positions right; in some instances he appears to deliberately misrepresent their views; and, most important, his own reasoning is characterized by unremitting carelessness. Moreover, there is a method to his carelessness—it enables him to systematically avoid addressing the tough arguments of his opponents. Hence we find him frequently setting up a straw man by misrepresenting the debate as a simple matter of science and reason versus superstition. Once having defined this as the issue, all he needs to do is assume the attitude of an outraged scientist and heap on the ridicule. But if he had done his homework and taken the trouble to really understand the science and logic supporting quantum spirituality, he would have discovered that it is harder to dismiss than he had imagined. Indeed, the more carefully—and yes, critically—one considers the issues, the more one finds quantum spirituality to be eminently worthy of serious consideration, as a plausible and measured approach to the most long-standing and intractable questions at the basis of science.

In my view, quantum spirituality will prove to represent a phase transition in the history of science of immense proportions. In this context Stenger's books, and those of like-minded debunkers, represent a futile rear-guard action, intended to forestall what will come to be seen as the inexorable progress of science toward a more profound understanding of natural law.

Debunking the debunkers

With the rise of modern science in the seventeenth century, consciousness and matter were assigned to radically different spheres. Mathematical physics pursued the investigation of matter as far as it could go without invoking consciousness or spirituality, while God and soul were assigned to the religious sphere. Toward the end of the nineteenth century, this uneasy truce was disturbed by the advent of psychology as a scientific discipline, which reintroduced questions about the relationship between science and religion that had been dormant since the overthrow of the geocentric worldview. But with the introduction of relativity theory and quantum mechanics, the assumption that physics can proceed without addressing consciousness has been called into question at an even more fundamental level.

Quantum spirituality—the idea that some aspect of consciousness plays a fundamental role in the universe and that advanced physics should be interpreted as having to some extent already incorporated this principle—has had distinguished representation among both physicists and philosophers, including many of the founders of quantum theory itself. Quantum spirituality has generated an upsurge of grassroots enthusiasm precisely because of the widespread sense that the uneasy relationship between science and spirituality has been based on a misconception, and that science and spirituality, rather than being fundamentally separate or even opposed, are in fact deeply connected and mutually reinforcing. Victor Stenger's purpose in writing *Quantum Gods: Creation, Chaos, and the Search for Cosmic Consciousness* is to “debunk” this idea as much as possible. In his view it is “the result of misunderstanding and, in some cases, intentional misrepresentation” (p. 18) of what science really says and means.¹

Stenger believes that he is bringing a scientific outlook and much needed critical thinking to the debate, and he encourages his readers to persevere in reading his book “since science and the ability to think critically, inside or outside science, can be learned only by diligent effort” (p.18). However, as we will soon see, it is actually Stenger's arguments that need the debunking. Even the British philosopher of physics Gordon McCabe, himself not particularly receptive to quantum spirituality, remarks about *Quantum Gods* that “there seems little evidence that Stenger has a knowledge of philosophy, or the philosophy of science. As a consequence, he commits the most obvious and egregious of errors” (McCabe, 2009).

In my view, quantum spirituality will prove to represent a historical phase transition of immense proportions. In this context I see Stenger's books, and those of like-minded debunkers, as a futile rear-guard action, intended to forestall what will come to be seen as the inexorable progress of science toward a more profound understanding of natural law. One major problem with trying to keep consciousness and spirituality outside the domain of physics is that physics can't responsibly accept the idea that anything is outside its domain. If something affects physical processes, physics is going to assign variables and operators, and start to model the interactions with equations. In this sense, the domain of physics is infinitely expandable. The old dichotomy between natural and supernatural phenomena, for example, is being superseded. From this perspective, even God's interventions would not be understood as a violation of natural law; they would embody a

deeper level of natural law, perhaps, but physics would still want to understand and model the operative principles.

There are two broad hypotheses about how consciousness should be integrated into the domain of physics. The first is that consciousness is to be understood as a localized product of brain processes. This appears to be what Stenger has in mind when he confidently asserts, “No empirical evidence supports the notion that mind is anything other than the product of purely material forces.” (p. 262) This approach has been the perspective of materialist philosophies of mind for a long time; but these have generated longstanding and apparently insoluble skeptical problems—such as the brain-in-a-vat premise on which the popular movie *The Matrix* was based—suggesting that this whole approach may be flawed. Incidentally, one need not look far for empirical evidence that mind is something other “than the product of purely material forces.” The inexplicable existence of consciousness and the cognitive autonomy inherent in moral responsibility and rational thought *prima facie* provides such empirical evidence. Stenger gives no argument whatever for why we should discount this evidence from everyday experience. Probably he means that neuroscience may someday provide an exhaustive account of mind and consciousness, and it is incumbent on anyone, who doubts neuroscience’s boundless capacity, to provide evidence to the contrary. But the distinguished philosopher of mind, Hilary Putnam, would consider Stenger to be over-confident:

Saying “Science may someday find a way to reduce consciousness (or reference, or whatever) to physics” is, *here and now*, saying that science may someday do we know-not-what we-know-not-how. And from the fact that those words may in the *future* come to have a sense we will understand, it no more follows that they *now* express anything we can understand than it follows from the fact that I may *someday* learn to play the violin that I can now play the violin” (Putnam, 1999, p. 173).

The second hypothesis is that consciousness and spirituality enter into physics at a more fundamental level of natural law and, indeed, if there is to be a reduction, it will be the material world that will prove to be a product of consciousness. This is the theme proposed by physicists and other researchers who ascribe to the model embodied in quantum spirituality. From this perspective, the reason that quantum spirituality generates such intense hostility in some commentators is not because it is an unscientific idea, but precisely because it would represent a scientific revolution of such enormous magnitude. Its acceptance would destabilize the worldview of those for whom the materialistic paradigm has become a *de facto* belief system—a faith-based secular religion. This would explain the degree of hostility displayed by Victor Stenger in *Quantum Gods* and by Michael Shermer, the *Scientific American* editor who wrote the foreword.

As a physicist and philosopher of physics, naturally I look for scholarship and thoughtful analysis in writings about important foundational and scientific material; but in this book I was severely disappointed. Stenger is a retired physicist who has decided to leverage his scientific background in order to discredit anything and everything that smacks of spirituality or religion. Certainly there are clear-thinking atheists and materialists who have made valuable contributions to the debates regarding mind and its place in nature. And, although I ultimately don’t agree with their positions, I can appreciate the

carefulness of their analysis—and my own thinking is clarified and enriched as a result of reading their work. But Stenger’s book is not like that. As we will see, his writing is polemical rather than conscientious; he doesn’t have enough respect for his intellectual opponents to get their positions right; in some instances he appears to deliberately misrepresent their views; and, most important, his own reasoning is characterized by carelessness throughout the book.

Stenger has published eight recent books in this vein, and his previous one, *God: The Failed Hypothesis. How Science Shows That God Does Not Exist*, was number 21 on the *New York Times* bestseller list. His books generally get enthusiastic reviews by the “new atheist” crowd, including such like-minded writers as Richard Dawkins, Christopher Hitchens, Sam Harris, and Michael Shermer. Shermer’s foreword establishes the polemical tone for their book with its provocative title, “Quantum Flapdoodle and Other Flummery.” This foreword refers to “quantum flapdoodle” or “flapdoodlists” four times in four pages, with “New Age nuttiness,” “airy fairy deity” and “pseudoscience” thrown in, to make sure we get the point.²

With this inauspicious beginning, the book takes the reader on a grand tour of science and spirituality, taking on not only “quantum spirituality” and “quantum theology” but also more traditional topics such as the argument from intelligent design and free will, not to mention the problem of evil and suffering, which has been vigorously debated for millennia. Stenger has a chapter devoted to debunking psychic phenomena,³ and he even takes a few swipes at alternative medicine. He ends with a chapter laying out his own conclusions about the implications of science for spiritual and philosophical questions, which he characterizes as “nothingism,” according to which, “The universe is truly comprehensible as a purely material system. We can fit all observations to a model of elementary particles ... that move around in an empty void—just as the Greek atomists’ conjectures from thousands of years ago ...” (p.239).

Stenger takes special aim at the two recent, popular films, *What the Bleep Do We Know* and *The Secret*, and particularly at the featured scientists in those films, including Fred Alan Wolf, Stuart Hameroff, Jeffrey Satinover, Amit Goswami and John Hagelin. He devotes a full chapter to assailing not only Hagelin but also Maharishi Mahesh Yogi, the Transcendental Meditation organization and Maharishi University of Management. In Stenger’s view, “Popular films and books over the past generation have promoted the notion that modern physics and particularly quantum mechanics have revealed a connection between human consciousness and reality that is purported to provide a scientific basis for a spiritual component to the universe.... However, none of these claims stand up under critical scrutiny ...” (p.242). As we will soon see, however, the problem is not that Stenger’s scrutiny is overly critical but that, on the contrary, he is not nearly critical or careful enough.

In the next sections we will analyze *Quantum Gods* from two points of view, one negative and the other positive. First, we will ask: Is Stenger’s book a paradigmatic example of *pseudoscience*? Debunkers love this word. Pseudoscience claims the prestige and authority of science but lacks the careful attention to detail and rigorous method

characteristic of real science. Second, and more important, although Stenger's treatment of quantum spirituality is unremittingly slapdash, he does touch on important issues concerning science and spirituality that deserve proper development. We will take this opportunity to do what Stenger ought to have done, namely, explain why serious-minded people think quantum spirituality is important and why it presents a profound and plausible alternative to the atheist/materialist option. Even if one ultimately disagrees with quantum spirituality, scientific method requires an accurate presentation of the ideas and a careful consideration of the best reasons for their adoption.

In the following pages, we will look at Stenger's misrepresentation of a number of the important themes underlying quantum spirituality, including:

- The powerful idea that there is a fundamental aspect of consciousness that is scientifically primary, and how this differs from the silly idea of individual solipsism.
- The manner in which key scientific theorists, such as Isaac Newton, attempted to integrate science and spirituality.
- The idea that a fundamental component of intelligence is non-computational, meaning neither deterministic nor random.
- What reductive materialism means and why it is difficult to reconcile with advanced physics.
- Why quantum measurement and quantum entanglement may provide a better framework than classical physics for understanding the physics of consciousness.

In addition, we will examine Stenger's ham-handed criticisms of the views of Maharishi Mahesh Yogi and quantum physicist John Hagelin. Finally, we will conclude with an evaluation of Stenger's version of materialist metaphysics, which he characterizes as *nothingism*, and we will show that there is substantially less to nothingism than Stenger imagines.

Why is Stenger so careless?

Stenger begins his critique of quantum spirituality with an overly simplistic statement of the theme of *What the Bleep Do We Know!?*:

The theme is simply stated: *Quantum mechanics teaches us that we make our own reality*. As we will see, this theme is central to what I call *quantum spirituality*, going back to the 1970s to an era that was called the *New Age*. (p.35)

This statement is simplistic because, to begin with, quantum mechanics doesn't teach philosophy, although it affords conceptual tools that may provide a richer framework for understanding and modeling the nature of consciousness and spirituality. Second, the *we* in "we make our own reality" refers to the idea that consciousness is the fundamental principle of reality; it needs to be emphasized that this is not the solipsistic idea that there are no natural laws and that we, as private individuals, can immediately have anything we want merely by wishing. And, third, the idea that consciousness is the fundamental principle of reality goes back farther than the 1970s.

Consider Stenger's report on his verbal sparring with the respected physicist and Vedanta philosopher Amit Goswami:

I accused Goswami of *solipsism*, which is the doctrine that the self is the only reality and the world is all made up in our heads. Goswami objected vehemently that this was not at all his position. However, he has said elsewhere that our notion of being separate individuals is an illusion. I still do not see how the existence of one common "self," the cosmic consciousness in which we all participate that manufactures reality, is any different from the solipsistic self who does the same. (p.39)

The fact that Goswami objected vehemently should have been a clue to Stenger that he needed to work harder to understand his opponent's viewpoint, and his not doing so is an indication of his unwillingness to take his intellectual opponents seriously. Anyway, is it really *so* hard to understand the difference between the idea of consciousness as the fundamental reality and the solipsistic idea that "the world is all made up in our heads"? Certainly consciousness is intimately related to "our heads"—the brain and nervous system—this aspect of consciousness is individual, and obviously there are many different and separate individuals. But Goswami is suggesting that consciousness has a deeper level, which is universal, and it is this fundamental level which is at the basis of all reality. Goswami's viewpoint—which is close to our own—is that this fundamental level of consciousness manifests both as the material world and as many different, conscious individuals. By contrast, solipsism is an unsophisticated view that you might hear at a late night freshman bull-session, where someone will provocatively argue that his own private inner life is all that there is, and everything else—including especially everyone he is debating—is just a figment of his imagination.

By trying to associate Goswami's sophisticated viewpoint with solipsism, Stenger is setting up a straw man. It's easier to change the subject and argue against solipsism than it is to address Goswami's real position. Stenger has a persistent habit of misrepresenting the views of his opponents, as we will see, and this lack of rigor is part of the reason why his book should be characterized as pseudoscience.

The idea that consciousness has a deeper, transcendental level which constitutes the ultimate reality has a long and influential history, especially in the ancient Vedic tradition of India, where it has predominated for millennia, with a resulting rich and comprehensive theoretical framework—together with systematic empirical methods—based on the primacy of consciousness. We will return to this Vedic conception when we discuss Maharishi's views below, in the context of Stenger's chapter on them.⁴

In Western thought the primacy of consciousness has had many distinguished representatives, including Plato, Leibniz, Immanuel Kant, Hume, George Berkeley, Hegel, Schopenhauer and Edmund Husserl. In one of the simplest presentations, called idealism, George Berkeley proposed that all material objects exist and interact in consciousness; ultimately they are all ideas in the mind of God. In response, in what must be one of the most famous non-sequiturs in Western philosophy, Samuel Johnson kicked a stone and proclaimed, "I refute [Berkeley] thus!" But, from Berkeley's point of view, Samuel Johnson, the stone and the laws of nature governing their interaction are all

embedded in consciousness; so Johnson simply failed to understand the implications of idealism.

What's worrisome in the present context is that Stenger also fails to understand the implications, or to consider them in a serious or thoughtful manner:

I will not take seriously the *idealist view* that there is only spirit. Samuel Johnson quickly refuted that by kicking a rock. The rock kicked back. (p.64)

But why isn't he taking this seriously, given that the 292 pages of *Quantum Gods* are entirely devoted to arguing against spirituality and the primacy of consciousness?

Stenger's carelessness is also evident in his reporting on the distinction between *theism*, which emphasizes the view of God as personal and actively intervening in the world, versus *deism*. The aspect of deism that Stenger is most interested in is the view that God "created the universe but left it alone thereafter" (p.16). Stenger mistakenly places Newton in the deist camp, maintaining (p.98) that "according to Newton we live in a clockwork universe with everything predetermined." Although Newton's laws of physics are deterministic, *only if they are assumed to be universally applicable* would this imply a clockwork universe with everything predetermined. And Newton himself explicitly rejected this view.⁵ Newton thought that the deterministic laws he had discovered had *limited applicability*, and that their limitations provided information about the nature of God's interventions. Throughout the history of science, many of the most important contributors have been profoundly engaged in the harmonizing of science and spirituality. Yet, in his rush to portray the debates about spirituality and religion in terms of a simplistic struggle between science and superstition, Stenger rides roughshod over the historical record.

Stenger's confusion about Newton's theism is, sadly, an all-too-typical instance of his superficial treatment of the deepest issues. A more conscientious examination of Newton's thinking would have discovered that, although Newton did not have the benefit of the 20th century scientific advances, he was already anticipating key insights of quantum spirituality at least in this respect: Scientific precision—rather than being inimical to spirituality—permits us to make a more exact determination of the nature of the interface between spirituality and the material world. Given that so many of the greatest scientific geniuses took this issue very seriously, if someone like Stenger wants to co-opt science for an anti-spiritual conclusion, it must be on the basis of careful and detailed arguments, because an anti-spiritual conclusion was not at all what these scientists had in mind. But careful argumentation is not what Stenger's book is about—where possible Stenger will avoid the need for argument by misrepresenting the historical record and, failing that as we will see, he will substitute ridicule for argument. In fact, this formula is *so* easy to replicate, it is surprising that he has only produced eight books in this vein since 1988!⁶

By the way, Stenger has also misrepresented the deist side of the theism/deism controversy. Although he is hostile to spirituality and religion in all their forms, he is a little more tolerant of his version of deism, because he sees it as a half-way house on the

way toward atheism. But his claim that deists “broke openly with Christian teaching” (p.16) is untrue of most deists—Descartes and Leibniz being among the most prominent—who saw themselves as reconciling Christianity and science. Likewise, his attempt to set up a contradiction between the personal God who responds to individual needs and prayers and the deist god who “created the universe but plays no further role in it” (p.27) is simplistic and misleading. The subtleties of the deist doctrine of pre-established harmony have evidently eluded Stenger, where God’s responsiveness to our prayers and his intercession on our behalf were built into the clockwork universe from the beginning. According to pre-established harmony, God anticipated our needs and prayers, and incorporated his responses in the laws of nature and the initial conditions of the creation.⁷

And it is not just the history of ideas that Stenger misrepresents. Contemporary physicist Roger Penrose has leveraged non-computational mathematics to support his argument for looking to new physics for the physical correlates of mind and consciousness. An important result in mathematics due to Kurt Gödel has been taken to show that mathematical intuition is non-computational—in other words it cannot be modeled by a computer algorithm. From this, Penrose suggests that the physical basis for human intelligence, in general, must involve a level of physics much deeper than the deterministic, mechanistic processes assumed by contemporary neuroscience, for which the brain is essentially just a complex computer. Moreover—and here is where Stenger gets it wrong—non-computational does not mean random. Contemporary computers have pseudo-random number generators built in, and Penrose makes a convincing case that randomness, as for example from a quantum mechanical decay process, “indeed does nothing useful for us; if anything, it would be better to stay with the pseudo-randomness ...” (Penrose, 1996, p.26). Randomness does not get at what is distinctive about human intelligence any more than deterministic processes do. Deterministic/random is not a comprehensive dichotomy—non-computational means both non-deterministic and non-random.⁸ These ideas are central to Penrose’s argument, and Stenger ought to have gotten them right.

But Stenger misunderstands and therefore misrepresents Penrose’s argument:

The brain could operate that way, being basically classical and deterministic, but occasionally being jolted by a random quantum event. What is interesting is that the decisions made on [sic] this fashion would be indistinguishable from creative acts or free will. Is that all there is to it? (p.190)

No, that is not all there is to it. Mathematical intuition, and any genuinely creative thought process, evidently—if Penrose is right—involves something more, which cannot be modeled by any combination of deterministic and random processes. Incidentally, Maharishi Mahesh Yogi referred to this something more as *creative intelligence* and, like Penrose, argued that this principle had to represent the fundamental level of nature’s functioning. As we will see below, Maharishi, together with quantum physicist John Hagelin, came to the conclusion that creative intelligence—representing the deepest level of consciousness—must have its source in the unified field, which quantum physics has

recently come to understand in terms of superunification, involving the unification of all of nature's force and matter fields.

Penrose's argument is a strong one, and it ought to be accurately presented and addressed, if Stenger is going to dispute Penrose's conclusion that consciousness will be incorporated into physics at its most fundamental level. Stenger consistently evades the forceful challenges to his materialist dogma, preferring to cast the arguments for the primacy of consciousness in terms of psychic phenomena, for which the evidence is controversial, or miracles, which are considered to be rare and elusive. Then he can set to work debunking, with his characteristic *scientistic* indignation. Although I think that psychic phenomena and miracles should be researched in a serious manner, Penrose's argument can be understood to mean that there are plenty of miracles much closer to home, intrinsic to the functioning of intelligence and intelligent intuition. We will take this up again later, when we discuss the theme emphasized by Nobel laureate, Eugene Wigner, regarding the unreasonable effectiveness of mathematics in the natural sciences.

In his review of *Quantum Gods*, Gordon McCabe answered the question posed in the title to this section—why *is* Stenger so careless?—as follows:

The principles of scholarship dictate that a professional researcher should be acquainted with all of the relevant literature, yet Stenger, and most of the physicists who write about philosophical subjects, do so with a blithe disregard for this principle. Curious. (McCabe, 2009)

In the next section, we will consider Stenger's lack of acquaintance with the philosophical literature relating to reduction and emergence, and show how it leads him to misunderstand and to obscure critical issues relating to the interpretation of quantum mechanics. Although this discussion involves some dense analysis, I think it is worthwhile to clarify the relevant terminological distinctions because, in so doing, we can better understand why it is reasonable to think that quantum holism involves consciousness and spirituality.

Reduction, Emergence, Wholeness and Consciousness

Stenger's argument involving the related ideas of reduction and emergence takes aim at holism, the idea that there are important circumstances in which a whole is more than the sum of its parts and that this emergent wholeness may have spiritual implications. But, given the importance for quantum spirituality and even for Stenger's own worldview (characterized by universal reduction to material particles), his treatment of reduction and emergence is surprisingly muddled. To explain in simple terms, the essential thing about reduction is the idea of *nothing over and above* and so, for Stenger, this would mean there is nothing over and above material particles and their mechanistic interactions. Frequently cited reductions from classical physics include the temperature of a gas as nothing but the average kinetic energy of its molecules, water as nothing but H₂O, light as nothing but a form of electromagnetic radiation and so forth.

And what about consciousness? Stenger's commitment to universal reduction to elementary particles implies a reductive view of consciousness. In his view:

The universe is truly comprehensible as a purely material system. We can fit all observations to a model of elementary particles (or perhaps strings or other forms of basic objects) that move around in an empty void—just as the Greek atomists' conjectures from thousands of years ago (p.239)

But consciousness is the phenomenon most resistant to a reductive analysis. Today, most philosophers of mind (even those sympathetic to the materialist perspective) have abandoned a fully reductive approach and believe that, even supposing neuroscience will someday provide an exhaustive account of all neurophysiological processes in the brain, consciousness will remain unaccounted for. In other words, consciousness—what it is like to have subjective experience—seems to be irreducible to neurophysiology. Most contemporary discussions in the philosophy of mind acknowledge “the hard problem of consciousness” (Chalmers, 1996), according to which the fact of consciousness will remain unexplained even if—and this is a big *if*—all the functional capacities of the mind could be accounted for in terms of neurophysiological processes. Even Jaegwon Kim, regarded as a leading advocate of a hardcore materialist perspective of mind, has backed away from a fully reductionist approach (Kim, 2005 and 2006).

Given the hard problem of consciousness, Stenger's reductionist outlook—“We can fit all observations to a model of elementary particles ...”—immediately beaks down; moreover, his reductionist project quickly runs into trouble with macroscopic phenomena as well, since these reductions typically invoke consciousness indirectly. To see this, consider the reductive analysis of the temperature of an ideal gas. This is a case that has been extensively discussed in the philosophical literature. In saying that the temperature of a gas reduces to the average kinetic energy of its molecules, part of what is meant is that temperature is not a *new* or additional property of the gas. In other words, the average kinetic energy—and hence the temperature—would already be implicit in a detailed specification of all the individual molecular kinetic energies. So Stenger's following assertion seems peculiar, given his reductionist outlook:

Properties of the whole gas such as pressure and temperature are meaningless for a single molecule. The gas can be thought of as a higher level of complexity with ... “emergent properties” such as pressure and temperature. (p.158)

The important issue that Stenger is obscuring, here, is that reduction means there are no physical properties of the gas over and above those already inherent in the individual molecules.

To make this clearer, if temperature reduces to the average kinetic energy of a large ensemble of molecules, then there is no property “of the whole gas” other than this average kinetic energy. This is what the reductive analysis of temperature means in this context. And further, on this analysis, the average kinetic energy of the ensemble provides no new information, since the average is a *summary* of the detailed specification of individual kinetic energies and, as a summary, it contains *less* information than the detailed specification. The bottom line, for the reductionist, is that this average is not a new physical property over and above the individual kinetic energies. Contrast this

reductive analysis of temperature with the irreducibility of consciousness: A detailed specification of the neurons in the brain and their physical processes will still not explain why we have subjective experience—the fact of subjective experience is new information.

Emergence, by contrast to reduction, involves the occurrence of something new in the sense of a property of the whole which is not already implicitly contained in the separately specified states of its independently existing constituent particles. But what kind of property could this be? As explained above, temperature is not a genuinely novel *physical* property. So, given that Stenger considers temperature to be emergent, in what sense could temperature be understood to involve something new, occurring as a function of wholeness?

Here, Stenger might have benefited from greater familiarity with the philosophical literature, since this issue has been vigorously debated since the foundation of modern science in the seventeenth century, and it gets to the core of the relationship between consciousness and matter. (John Locke's famous doctrine of secondary qualities represents a traditional way of framing the issue.) Briefly stated, reductionists have typically invoked consciousness, in some form or other, as the basis for what is new and emergent. This enables the reductionist to say that nothing physically exists over and above the particles and their motions, but that something new emerges *in the way we perceive, understand or describe* the whole ensemble. On this analysis, temperature is a composite idea, with an objective component consisting of material particles and their motions, and a subjective component, involving consciousness. This subjective component has a number of aspects which contribute to our understanding of temperature. One familiar aspect involves our sensations of heat and cold; these sensations—today philosophers refer to them as “qualia”—exist in the mind of the observer and we project them out onto the material world. Consciousness, in this conception, is conceived of as separate from objective reality, although the motions of the particles “out there” causally influence—filtered by our sensory apparatus and nervous system—the qualia that occur in our conscious minds.

Stenger's concept of “reductive emergence” would correspond to the traditional conception of reduction, outlined above, except that Stenger would emphatically not accept an essential and irreducible role for consciousness in his analysis. But if the property of the whole is not ultimately something subjective—a sensory appearance or qualia, or the meaning we have in mind when we describe an ensemble—depending on the consciousness of the observer, then it would seem to be a real, objective property of the whole. And, if it is, Stenger's term “reductive emergence” is as oxymoronic as it sounds—positing a real property of the whole (emergence) while at the same time insisting that there is nothing over and above particles (reduction).⁹ Stenger would have been better off to leave emergence out of his self-contradictory conception of “reductive emergence,” since he just means reduction.

Stenger contrasts “holistic emergence”—in which a new property of the whole arises which is not reducible to particles—with “reductive emergence” (reduction). Since he is

committed to the view of universal reduction to material particles, Stenger cannot allow that there are any genuine instances of holistic emergence:

The proponents of emergence are not willing to leave it to reductive emergence. They desperately want to find “something there” besides particles, although for the life of me I don’t see what they have against particles. I worked with them all my professional life and found much to like about them ... The doctrine that opposes reductive emergence I defined above as holistic emergence. The basic idea is that the whole is greater than the sum of its parts and that at least some emergent principles ... have developed the ability to act downward, that is, have the emergent property of top-down causation. (Stenger, pp. 159-160)

Someone might “desperately want to find ‘something there’ besides particles” for the obvious reason that the macroscopic world of common sense, as well as most of science, involves holistic concepts that are not apparently reducible to particles. This implies either (1) genuine holistic emergence or (2) reduction combined with an explanation of holistic appearances (ultimately involving consciousness, as described above). On this second option, temperature does not involve a new physical property; the emergence occurs in relation to the observer. Similar considerations apply to other holistic phenomena, such as the wetness of water, where part of what is meant by “wetness” involves the sensations that liquids typically produce in us. Neither of these two options is compatible with Stenger’s reductive particle metaphysics: (1) is incompatible because it invokes holistic properties irreducible to elementary particles and (2) is incompatible because it gives an essential role to consciousness.¹⁰

Maybe lack of acquaintance with the relevant philosophical literature is part of why Stenger avoids addressing the relationship between emergence and consciousness. But the idea that wholeness is essentially interwoven with consciousness is not a new or even an especially radical idea—it is at the basis of most of the traditional reductive explanations of macroscopic phenomena, as noted above. Although classical physics assumed the working hypothesis of general reducibility to independently-existing, atom-like particles—consistent with Stenger’s belief system—this is not true of quantum physics. As we will see in the next section, quantum physics is evidently replete with the holistic emergence that Stenger so vehemently eschews. Moreover, Stenger’s efforts to impose a reductionist interpretation on phenomena such as quantum entanglement are irredeemably confused.

Entanglement: what’s the big deal?

According to Abraham Maslow’s familiar quip, “If the only tool you have is a hammer, you tend to see every problem as a nail.” Likewise, if all that science knows is localized particles interacting in terms of mechanistic causation, then our theories of mind are going to try to see mind in these terms and reject or eliminate anything—whether it is religion, spirituality, or even moral responsibility—which doesn’t fit this model. But quantum physics may offer tools that are better suited to a sophisticated model of consciousness and spirituality.

Quantum entanglement presents a problem for materialism precisely because it incorporates a form of holistic emergence. And wholeness, as explained in the previous section, has traditionally been linked to consciousness.¹¹ The rejection of holistic emergence is a central feature of Stenger's materialism; moreover, this rejection has been a long-established tenet of materialism in general. So if the basic laws of quantum physics involve holism and they are interpreted realistically, as characterizing objective reality at its most fundamental level, then this would seem to point in the direction of exactly the kind of spiritual conclusion that Stenger wants to avoid. Given that Stenger is a committed materialist and he understands his materialism in terms of reduction to atom-like particles, one might imagine that he would provide an in-depth analysis of quantum entanglement and explain why it doesn't undermine his opposition to quantum spirituality. So how should we understand Stenger's simple-minded dismissal of EPR entanglement?

The EPR experiment results are widely discussed in the literature of quantum spiritualism. Physicists, on the other hand, are underwhelmed. Quantum mechanics has passed yet another empirical test. Ho hum. (p.127)

Ho hum? EPR was the culmination of decades of intense debate between Einstein, defending the classical-particle worldview, and Niels Bohr, Werner Heisenberg, Wolfgang Pauli and the other leading figures in the development of quantum mechanics. All of them realized that nothing less than our fundamental conception of reality was at stake: does it consist in a reduction to separate, independently existing particles, or is fundamental reality characterized by unanalyzable features of wholeness? The distinguished physicist David Mermin refers to this as the "sublime mystery" of quantum mechanics.

Many of the paradigmatic discussions of entanglement refer to a two-particle system with total spin-0 which, by conservation of angular momentum, constrains each of the constituent particles to have opposite spins—if one is spin-up, the other must be spin-down. Now here is the crucial point: *The individual particles are not in a definite spin-state until a measurement is made.* It is only at the time of measurement that one of the particles assumes a definite spin in the direction measured—either spin-up or spin-down. This result gets instantly communicated to the other particle and collapses its spin state, which was until then an indeterminate combination of spin-up and spin-down. This nonlocal entanglement between the two particles is precisely the kind of holistic, emergent and top-down kind of phenomenon which many think may contribute to a better framework for understanding consciousness than the classical conception of reduction to particles as separately existing, independently defined bits of matter.

"Entanglement" is Erwin Schrodinger's elegant and descriptive term, introduced in a 1935 article discussing Einstein's famous (EPR) argument against quantum mechanics:

When two systems ... enter into temporary physical interaction due to known forces between them, and when after a time of mutual influence the systems separate again, then they can no longer be described in the same way as before [as independent systems]. I would not call that *one* but rather *the* characteristic trait of quantum mechanics, the one

that enforces its entire departure from classical lines of thought. By the interaction the two [quantum states] have become entangled. (Schrödinger, 1935)

Given that his book is dedicated to refuting the significance of quantum physics for consciousness and spirituality, Stenger devotes surprisingly little attention to entanglement and nonlocality. When he does address it—here he is speaking about the Pauli exclusion principle, which also involves quantum nonlocality—his conclusion is unexpectedly confused:

The Pauli principle naturally emerges when more than one electron is involved, but it is still derived from basic quantum mechanics. It is an example of emergence that is reducible to basic physics, what might be called *reductive emergence*. (p.157)

The first sentence misses the whole point of the debate. It is precisely because emergence is built into basic quantum mechanics that quantum physics appears to be more relevant for modeling and understanding consciousness and spirituality than classical physics has been. The second sentence invokes Stenger's problematic concept of reductive emergence; but the deeper confusion has to do with an ambiguity in the phrase "reducible to basic physics." Does he mean (1) reducible to atomistic, materialistic particles? Or does he mean (2) reducible to the basic laws of physics, regardless of what they refer to. Until now he has been talking about reduction to atomistic particles, but entanglement is inconsistent with that view of reality. So he has pulled a switcheroo, without so much as a hint of embarrassment, and is now talking about reduction to "basic quantum mechanics." But basic quantum mechanics is certainly not about particles in the sense of the Greek atomists. And whether it is about matter, exclusively, is exactly the issue of quantum spirituality!¹²

Stenger not only dismisses the idea that the advances in physics may have relevance for consciousness and spirituality but also seems to overlook the fact that these advances have introduced any significant changes in our worldview at all:

Often one hears that modern physics showed that Newtonian physics was proven wrong by the twin twentieth-century revolutions of relativity and quantum mechanics. Nothing can be further from the truth. To this day Newtonian mechanics remains the foundation of physics and the natural sciences that are built upon physics. (p.95)

This statement—about Newtonian mechanics remaining the foundation of physics—would perhaps be OK if it were addressed to a class in mechanical engineering. But it is emphatically not OK when the issues concern the character of fundamental reality.

We are again led to contemplate whether Stenger's apparent carelessness might be a deliberate part of his argumentative strategy. It enables him to evade the real issues and recast the debate more simplistically, in terms of straw men which are easier for him to knock down. This strategy is very much in evidence in his discussion of Maharishi Mahesh Yogi (see below).

What did Maharishi really say?

In his chapter entitled “What the Bleep is the Secret?,” Stenger discusses a number of the scientists who appeared in the recent documentaries on quantum physics and spirituality, including John Hagelin. He twice (p.37 and p.43) quotes Hagelin referring to the primacy of consciousness and its identity with the unified field as understood by quantum physics, but, surprisingly, his introduction of Hagelin says nothing about his being a physicist. Moreover, nowhere in the book does he mention Hagelin’s more than 70 publications in the fields of electroweak unification, grand unification, super-symmetry and cosmology, including a number of papers which have become core references in particle physics.¹³ Here, in this chapter, Stenger mentions only that Hagelin is a prominent leader in the Transcendental Meditation organization and ran for president on the Natural Law Party ticket in 1992, 1996, and 2000. While this information is true and interesting, by not mentioning Hagelin’s physics background, Stenger is disingenuously prompting the reader to wonder what qualifies Hagelin to speak authoritatively on the significance of the unified field of quantum physics.

But this disingenuousness pales in comparison with the misinformation and deliberate disinformation in his later chapter entitled “The Guru of GUTs.” The chapter is devoted to not only John Hagelin but also to the global Transcendental Meditation organization, Maharishi University of Management, and Maharishi Mahesh Yogi himself—the guru referenced in the chapter title. GUTs refers to grand unified theories, which represent one in a series of steps of integration converging toward a superunified “theory of everything.” The chapter title is itself an indication that we’re in for trouble ahead because, while Maharishi and Hagelin went to great lengths to urge that pure consciousness, the deepest level of mind, is identical to the *unified field*—the level of superunification—they *never* associated pure consciousness with the level of grand unified theory.

As a member of the faculty at Maharishi University of Management, and given that I have enormous respect for both Maharishi and John Hagelin, I admittedly have taken Stenger’s disinformation campaign personally. Nevertheless, if you will bear with me, I think that as we sort through the issues, we can arrive at a clear understanding of what Maharishi and Hagelin have actually proposed, how Stenger misrepresents their views, and why.

First, let’s review the facts. Maharishi Mahesh Yogi, himself trained in physics, is the founder of the Transcendental Meditation® (TM®) program and is regarded by many (including myself) as the leading scientist of consciousness in our time. Maharishi established Maharishi University of Management (M.U.M.), as well as a number of other universities throughout the world, organized around the principles of Consciousness-BasedSM education, which emphasize the development of the student’s consciousness in the context of traditional academic study. Today, many psychology and cognitive neuroscience academic programs have complemented the standard objective methods for studying consciousness by incorporating phenomenology laboratory programs in which students employ first-person, introspective techniques to explore the inner dimension of subjective experience. Maharishi University of Management’s *research in consciousness*

laboratory program, with its emphasis on the development of higher states of consciousness, was personally structured by Maharishi and is arguably the most advanced and successful phenomenology lab program in the world.

John Hagelin is a Harvard-trained quantum physicist and an acknowledged authority in unified quantum field theories. His prominent role in the development of the highly successful grand unified theory based on the mathematical structure called *flipped SU(5)* is widely acknowledged,¹⁴ and his works include some of the most cited references in the physical sciences. For example, (Ellis, Hagelin, Nanopoulos, Olive and Srednicki, 1984) had a remarkable 589 citations as of mid-2007. Perhaps the most distinctive aspect of Hagelin's derivation of *flipped SU(5)* is that he based it in on the deeper-level superstring, representing the unified field at the most fundamental level of nature's functioning. Although predominantly theoretical, this model, as developed by Hagelin and his collaborators, has provided significant support for grand unified theory and, indeed, for superstring theory as well. Grand unification and, especially, superunification on the basis of the superstring are active areas of research at the forefront of theoretical physics and, although they are not yet experimentally verified, many physicists believe that they are too mathematically elegant to be fundamentally wrong. In recognition of his role in these achievements, Hagelin was named winner of the prestigious Kilby International Award in 1992.

As he was recovering from a motor-vehicle accident in 1970, while still in high school, Hagelin had taken the advice of one of his doctors and learned the practice of Transcendental Meditation. He was delighted with his personal results, and became active in the TM movement and, before very long, he found opportunities to study and work closely with Maharishi. Remarkably, during the period (1979-1994) of his most concentrated activity in theoretical physics, Hagelin was also intensively investigating the nature and origin of consciousness, and this work is reflected in his publications on consciousness and the unified field of physics (Hagelin, 1987 and 1989).

After completing his dissertation at Harvard in 1981, with advisors Howard Georgi and Nobel laureate Sheldon Glashow, Hagelin accepted a post-doctoral research position at CERN (the European Center for Particle Physics). Following his year at CERN he pursued his research at SLAC (the Stanford Linear Accelerator Center) until 1984, when he moved to Maharishi International University (MIU)¹⁵ where he established a doctoral program in elementary particle physics with support from the National Science Foundation. One special focus of this doctoral research program was that at the deepest level of reality—the level of the unified field—consciousness and matter are fully integrated. Hagelin's mentors and colleagues at Harvard, CERN, SLAC and elsewhere took this transition in stride. Glashow remarked, "His papers are outstanding. We read them before he went to MIU and we read them now." But more importantly for the long-term attitude of the theoretical physics community toward consciousness, nearly every serious researcher in particle physics understood Hagelin's career move as a statement of his deeply held conviction. And based on their respect for his work, many in theoretical physics have been motivated to at least contemplate the potential significance of consciousness for future progress in physics.

It was during the early 1980s that Hagelin and Maharishi formulated the principle identifying Transcendental Consciousness—the deepest level of inner, subjective experience—with the unified field as it was coming to be understood in terms of mathematical physics. Interestingly, by Hagelin's own account, the impetus for his derivation of *flipped* $SU(5)$ from the superstring came from his understanding of consciousness as the fundamental principle of natural law. Indeed, he specifically credits Maharishi's inspiration as contributing to his discovery: "Maharishi's interest in exploring the foundations of physics, and in connecting the intelligence of the human mind with the intelligence of nature, gave me the impetus to switch the focus of my research to the most fundamental area of my field. This habit of considering nature from its deepest and most unified level helped me see the significance of Flipped $SU(5)$."¹⁶

Consistent with this proposed identification, Hagelin has published empirical research substantiating the existence of long-range field effects of consciousness generated through collective meditation (Hagelin *et al*, 1999). This research suggests that large meditating groups can nonlocally defuse acute societal stress—thereby contributing to the prevention of violence and social conflict, and providing a possible foundation for permanent world peace.¹⁷ Over time he has accepted increasing responsibility in the international Transcendental Meditation organization with the aim of advancing the Consciousness-Based programs Maharishi developed. With the accelerating proliferation of nuclear weapons technology, Hagelin feels that there really is an increasing urgency for the scientific community to seriously consider the inherently life-supporting, and theoretically much more powerful, technologies that Maharishi's programs offer.

Since the primacy of consciousness and its identity with the unified field are so central to the views of both Maharishi and Hagelin, let's explore these ideas in a little more depth. The various parameters which characterize macroscopic physical reality and which are embodied in classical physics—such as mass and energy, the three spatial dimensions and time, the electric and magnetic fields, and so forth—have all been progressively unified as physics has advanced. This pace of unification has accelerated in the last few decades, leading first to electroweak unification (uniting electromagnetism and the weak force), then to grand unification (incorporating the strong force) and, most recently, to superunification, which incorporates gravity to fulfill Einstein's dream of uniting the fundamental forces of nature on the basis of a theory of the unified field (see Fig. 1).

Superunification not only combines the four fundamental forces but also uncovers a deep and far-reaching unification underlying bose fields (representing forces) and fermi fields (representing matter). The distinction between force (responsible for action, dynamism, change) and matter (inertia) is basic to our common-sense conception of the material world, and it is certainly basic to classical physics. Even our language is based on the distinction between nouns, representing things and stuff, as opposed to verbs, representing activity and change. So the extent to which superunification involves a departure from our common-sense assumptions about reality can hardly be overstated.

It is in this context that Maharishi, in partnership with Hagelin, proposed that there is also a deep unification underlying the inner dimension (mind and consciousness) and the material world. It is true that our ordinary, waking experience of the world is based on a seemingly fundamental opposition, where the subjective pole of experience (the consciousness of the observer) is set against the objective pole (the external or material world). But Maharishi and Hagelin suggest that the unified field of advanced theoretical physics is actually the same as a unified field of consciousness. Maharishi refers to this fundamental level of consciousness as Transcendental Consciousness, a field of pure intelligence. Based on this proposed unification of Transcendental Consciousness and the unified field of physics, the Transcendental Meditation program is sometimes characterized as the “Maharishi Technology of the Unified Field” (see Fig. 1).

Now, back to Stenger’s disinformation campaign. Maharishi and Hagelin have

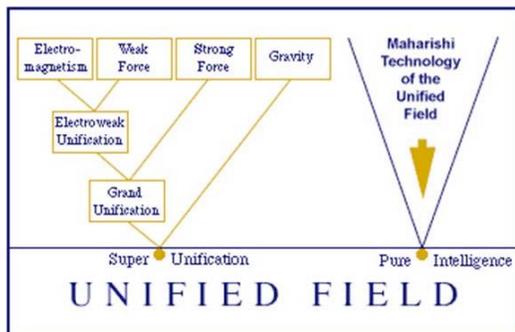


Figure 1. Maharishi and Hagelin propose that the unified field at the basis of superunification is identical to the field of pure intelligence at the deepest level of our own inner, subjective experience. This represents a true “theory of everything.”

consistently identified Transcendental Consciousness with the *unified field*, and have done so in countless lectures and interviews as well as in numerous readily available published materials. For ease of expression, let’s refer to this as the Maharishi-Hagelin identity principle.¹⁸ They have never identified Transcendental Consciousness with grand unification, which is a way-station in the progress of advanced physics and not the final goal of a completely unified theory. So Stenger’s consistently and mistakenly linking the Maharishi-Hagelin identity principle with grand unified theories (GUTs) is terribly misleading. Moreover, given the ready availability of both printed and online source materials and given the fact that Stenger has actually *quoted* Hagelin (p.37) and other TM literature (p.57) referencing *the unified field* as a field of consciousness or intelligence, it is difficult to avoid the conclusion that Stenger is cynically and deliberately misrepresenting Maharishi and Hagelin.

Why, for example, does he tell us that, “His [Maharishi’s] ear caught the catchy term ‘grand unification’ and pretty soon flyers were appearing in which the cosmic field of consciousness, with which TM supposedly put you in contact, was associated with the grand unified field” (p.60). We challenge Stenger to show evidence that any such flyer ever existed that linked grand unification with TM practice. Moreover, Maharishi never even discussed the early GUT called “minimal SU(5)” in any public lecture, and he certainly never associated the TM program with minimal SU(5). But Stenger is undeterred: “The problem was, minimal SU(5) was falsifiable” (p.60), and he goes on to outline the experimental evidence which discredited SU(5). But, he assures us, “The demise of minimal SU(5) did not cause GUTs to disappear from TM literature” (p.60).¹⁹

So why on earth would Stenger want to link Maharishi to SU(5)? It's an association Stenger made up out of whole cloth. But, since SU(5) is a discredited theory, a reader who doesn't know any better might get the impression that Maharishi's ideas are tied to discredited science. And, in fact, this is just the impression he gave the hapless *New Scientist* editor Amanda Gefter. Thus she confidently declared in her enthusiastic—"with Stenger in charge ... we are on sure ground"—review of *Quantum Gods*:

Maharishi claimed that transcendental meditation gave practitioners access to the "quantum field of cosmic consciousness". This, he said, was identical to SU(5), the model physicists were then investigating in their search for a grand unified theory. Sadly for cosmic consciousness, real experiments later falsified SU(5).

Nice zinger, Amanda, but the falsification of SU(5) has nothing to do with Maharishi. With Stenger in charge, the spread of misinformation is hard to keep up with! (For some reason, both Stenger and Gefter seem unwilling to honor the *Transcendental Meditation* trademark—it should be capitalized.) Although Gefter didn't pick up on this, Stenger does finally move on from SU(5) to *flipped SU(5)*. Whew! That's a relief.

But we're no sooner out of the frying pan then we're into the fire. His first sentence on flipped SU(5) starts out OK (p.61): "One particularly interesting GUT that appeared in the late 1980s was called *flipped SU(5)*." But then Stenger gets petty again: "TM literature would have you think it was (1) primarily the work of Hagelin and (2) a highly successful GUT fulfilling Einstein's dream of a unified field theory." He quotes Hagelin's website:

He [Dr. Hagelin] is also responsible for the development of a highly successful Grand Unified Field Theory based on the Superstring.

And follows up with this comment: "The earliest reference to flipped SU(5) that I could find is a 1982 singly authored paper by Stephen Barr. A 1984 paper lists three authors, not including Hagelin. Hagelin is one of four coauthors of a 1987 paper."²⁰ Does Stenger really want to challenge the significance of Hagelin's contribution to flipped SU(5)? This is way over Stenger's head and out of his league. Firstly, as to the fundamental significance of the theory, flipped SU(5) is unquestionably the most successful GUT, because it:

1. Is fully consistent with all experimental data (unlike minimal SU(5), for example);
2. Is free from a severe technical problem, known variously as the "doublet-triplet splitting problem," the "fine-tuning problem," or the "gauge hierarchy problem" that plagues all other GUTs;
3. Makes successful predictions for particle masses, including nearly massless neutrinos and the correct bottom quark to taon mass ratio, in the context of string-derived flipped SU(5);
4. Is the only GUT that appears to be consistent with superstring superunification.

None of these essential features were discovered in the early explorations of flipped SU(5), prior to Hagelin's contribution. One extra point to bear in mind is that Hagelin's flipped SU(5) theory is supersymmetric. This is a major transformation of the theory, and obviously not considered in Barr's original exploration, which was before supersymmetry became prominent. Stenger's couple of hours of internet searching does not qualify as sound historical method and in no way undermines the authority embodied in Hagelin's extensive, and highly-regarded, publication record.

What could Stenger's motivation be for nitpicking about the degree of Hagelin's responsibility for flipped SU(5)? Well, on a little reflection it's really quite simple. In evaluating a far-reaching set of proposals, such as those embodied in quantum spirituality, we naturally will want to consider the sources. Who are the scientists speaking for quantum spirituality and what are their credentials? The more reputable they are, the more we will be inclined to take their ideas seriously. So it serves Stenger's ends to try to diminish the stature of his intellectual adversaries—thus his motivation is pretty straightforward, but it's not very edifying.

Before concluding this disgraceful chapter, Stenger takes several jabs at the Transcendental Meditation program. While conceding that “studies in Fairfield and elsewhere indicated that meditation has some marginally beneficial medical effects such as lowering blood pressure,”²¹ he assures us that “Independent experiments at Harvard and elsewhere indicate that almost any relaxation method[s] ... work equally well”²² (pp. 56-57). In reporting on the Transcendental Meditation course, Stenger writes:

TM training begins with a free lecture on the “benefits” of the technique, complete with scientific-looking charts of the body's physical response. (p. 57)

Why the sneer quotes around benefits, and why “scientific-looking” charts? The benefits of TM practice are real and well documented, and the charts accurately summarize published research—they are scientific charts.

Stenger also mocks the idea of enlightenment, scoffing that:

Exactly what constituted the promised enlightenment seemed to change from year to year, as Maharishi meditated privately on the question at the beginning of each year. For example, 1970 was the Year of Scientific Research, 1973 the Year of the World Plan, 1978 the Year of Invincibility to Every Nation, and so on. (pp. 57-8)

At the beginning of each year, Maharishi would refocus the activity of the international Transcendental Meditation organization, but this had nothing to do with what he meant by enlightenment. In fact, Maharishi was quite consistent and precise about what constitutes enlightenment, or higher states of consciousness. He organized conscious experiences based on a taxonomy of seven states of consciousness, including four higher states (see Figure 2). With continued practice, Transcendental Consciousness becomes stabilized in the awareness and is no longer exclusively experienced in the sheltered setting of eyes-closed meditation. A process of evolution occurs, typically over a period of years, during which Transcendental Consciousness becomes integrated with the

ordinary states of waking, dreaming and deep sleep. Phenomenologically, these integrated states provide a more stable and expanded sense of Self—and research indicates that these integrated states provide the associated psychological benefits of increasing maturity and self-actualization.

Maharishi characterized the second higher state as Cosmic Consciousness. The third higher state

is called God Consciousness, which is characterized by increasingly refined perception, to the point where one grows to perceive and appreciate the more subtle levels of the objective world, including—it is said—the intelligence underlying and supporting all that there is. The fourth, and highest state, is called Unity Consciousness, or Brahman Consciousness. In Unity Consciousness, all things are perceived and understood in terms of the unbounded, infinite status of one's own Self. All differences and distinctions are perceived as superficial manifestations of an underlying field of unity and wholeness. And if Maharishi and Hagelin are right, this is none other than the unified field as understood by quantum physics. The entire taxonomy, including the three ordinary states of waking, dreaming and deep sleep, is depicted in Figure 2.

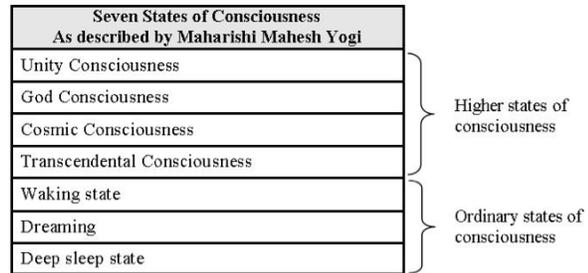


Figure 2. Maharishi's classification of the seven states of consciousness.

Moreover, there is an abundance of high-quality, secondary literature about what enlightenment means in the context of Maharishi's teaching. Expanding on the suggestions of numerous leading psychologists—such as Carl Jung, Victor Frankl and Abraham Maslow—psychologist Charles Alexander's research showed how higher states, as delineated by Maharishi, provide a quality of life that is verifiably richer in meaning and self-actualization.²³

At this point one might ask: What exactly is Stenger getting at with his unfounded and misleading remark that “what constituted the promised enlightenment seemed to change from year to year?” If he wanted to suggest that there aren't any objective measures of what constitutes enlightenment, then why didn't he just come out and say that? In any case, if he had done his homework Stenger would have learned that, in fact, there are significant objective measures corresponding to not only Transcendental Consciousness, but the enduring higher states of consciousness as well.

In recent years, research documenting the correlation between transcendental experience and alpha EEG coherence (and most recently, alpha zero-lag phase synchrony²⁴) has provided important objective documentation of first-person reports of transcendental experience. Research on subjects who regularly experience Transcendental Consciousness—with its associated alpha EEG coherence—shows a high degree of correlation between EEG coherence and numerous variables, indicating cognitive, intellectual and creative development as well as high levels of psychological and physiological health.

Moreover, Fred Travis and Alarik Arenander have investigated the experience of long-term TM meditators, reporting the co-existence of transcendental experience along with waking and sleeping, as predicted for the three highest states of consciousness. In an important study, published in 2002, subjects' first person reports correlated quantitatively with a set of EEG measures, both during meditation and during both simple and more challenging, choice-dependent tasks (Travis, Tecce, Arenander and Wallace, 2002). Choice contingent negative variation (CNV) measures for the long-term meditators, as compared to control groups, indicated a more efficient style of neurological functioning. A composite z-score was calculated, for each subject, which combined EEG coherence and amplitude readings with CNV measures. The results are shown in Figure 3.

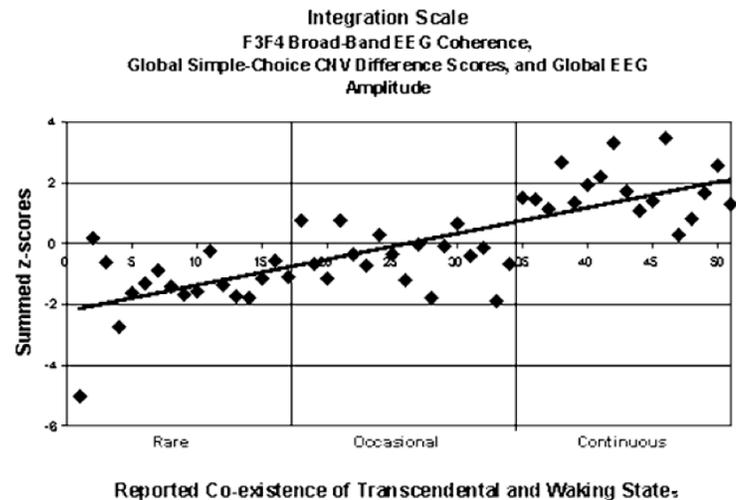


Figure 3. A brain-based integration scale.

The study compared three groups of subjects, differentiated according to self-reported integration of transcendental and waking (as well as sleep) states: The Rare and Occasional integration groups served as controls for the Continuous integration group. These three groups define the horizontal axis in Figure 3. The vertical axis provides a quantitative scale for the summed z-scores for the EEG measures evaluated. Each data point represents a subject. The regression line through these points suggests that transformations in cortical functioning correspond to increasing integration of the transcendent and waking states and may, therefore, represent an *integration scale*. This integration scale provides a quantitative, objective measure of higher states of consciousness—enlightenment.²⁵

A recurring question has been, why does Stenger so systematically misrepresent the positions of those with whom he disagrees? Is it a simple matter of not having done his homework? In his chapter on Maharishi, Hagelin and the TM program, it is hard to avoid the conclusion that some of the misrepresentation is deliberate.

Much ado about Nothingism

Stenger devotes considerable attention to arguing that there is no evidence of miracles and that, therefore, everything in the world can be explained by science, without supposing that there is an intelligence intervening in the natural world. But many thoughtful people believe that science itself is a miracle, and that broad scientific themes—such as the orderliness in nature and the existence of laws of nature which we have the ability to comprehend—point to the fundamental nature of consciousness and

even to a creative intelligence at the basis of the natural order. *Nothingism* is Stenger's attempt to provide a materialist/atheist answer, based on (1) a speculative, scientific-sounding narrative of how the cosmos came out of a state of maximum disorder in the big bang, and (2) an amateurish contribution to the philosophy of science proposing that the laws of nature are not really laws at all in the sense of constraining the behavior of matter. But Stenger's reasoning is deeply problematic as we will soon see.

Before advancing these critiques I would like to mention one kind of criticism that we are *not* directing at Stenger. We are not maintaining—as some would—that Stenger's attempt to interpret the implications of science for deeper philosophical questions is automatically illegitimate because science has nothing to say about these deeper issues. We think that it does, but that the conclusions to be drawn are not the ones that Stenger hopes to draw. In any case, it is noteworthy that in a book whose first words are “quantum flapdoodle,” Stenger shows no hint of embarrassment in drawing radically speculative conclusions for nothingness. His sense of outrage is selectively directed at those who suggest that science—especially quantum physics—may have profound spiritual implications. Where is the skepticism, the self-criticism, the demand for rigorous standards of reasoning when pursuing his thesis that intelligence and consciousness are not fundamental features of reality? In other words, his outrage is based on a double standard and is not even-handedly aimed at *speculation*, beyond what current science can strictly verify. It is the conclusion—quantum spirituality—that he finds so problematic. He is not really interested in the arguments of his intellectual opponents at all—which is why he doesn't take the trouble to represent them accurately—suggesting that his outrage is that of a religious (atheism/materialism) fundamentalist.

Did the universe originate in maximum disorder?

Order suggests intelligence, and the orderliness in nature that is at the basis of science is often taken to indicate that intelligence exists at the most fundamental level of nature's functioning. But what if disorder, rather than order, is the basic cosmological principle and has been since the big bang? This is precisely what Stenger has in mind when he confidently asserts that, “our universe ... begins in a state of maximum disorder, or total chaos” (p. 248). Why does he believe this? Modern quantum cosmology theorizes that the universe exploded from a Planck-sized volume—which is to say a very small but finite volume. But from this understanding he overreaches, concluding that “it is a region of maximum entropy” (p.249). And again, “... we have seen that modern cosmology strongly suggests that the universe within which we reside began in a state of total disorder” (p.252). His argument is based on the dubious premise that the Planck-sized volume which is the source of the big bang is a black hole:

A sphere with a radius equal to the Planck length is a black hole, so its entropy is maximum. Thus, the universe starts out as a black hole with maximum entropy. (Stenger, p.249)

But respected string theorist Brian Greene flatly contradicts this conclusion: “*The ultimate source of order, of low entropy, must be the big bang itself.*” (Greene, 2004, p.173, Italics in the original.) Greene explains:

In its earliest moments, rather than being filled with gargantuan containers of entropy such as black holes, as we would expect from probabilistic considerations, for some reason the nascent universe was filled with a hot, uniform, gaseous mixture of hydrogen and helium. Although this configuration has high entropy when densities are so low that we can ignore gravity, the situation is otherwise when gravity can't be ignored; then such a uniform gas has extremely low entropy. In comparison with black holes, the diffuse, nearly uniform gas was in an extraordinarily low-entropy state. Ever since, in accordance with the second law of thermodynamics, the overall entropy of the universe has been gradually getting higher and higher; the overall, net amount of disorder has been gradually increasing. (Greene, pp.173-174)

If Greene is right, what would this do to Stenger's argument against an intelligent creator? The logic is simple: if Stenger believes that ultra-high entropy at the big bang would be evidence against an intelligent creator, then obviously—if the big bang was in fact characterized by ultra-low entropy—he ought to believe that this would constitute evidence *for* an intelligent creator.

What kind of law doesn't constrain behavior?

Einstein observed that "The most incomprehensible thing about the world is that it is comprehensible." From the perspective of the materialist, there is no explanation for the law-like behavior of the material world or for our ability to understand and model this behavior with our scientific laws, especially our most fundamental laws, the laws of mathematical physics. These laws evidently connect our cognitive faculties with the way the material world is constrained to behave—but why should the material world be constrained to behave in a law-like manner? Moreover, why should our minds be tuned to this law-like behavior? Physicist and Nobel laureate Eugene Wigner was even more explicit than Einstein:

It is difficult to avoid the impression that a miracle confronts us here ... [or] two miracles of the existence of laws of nature and of the human mind's capacity to divine them.

If Stenger is to succeed in co-opting science for the anti-spiritual camp, he must have an answer to Einstein and Wigner.²⁶

Moreover, Stenger is worried about the very idea of physical laws: if there are laws governing the behavior of matter, this might suggest a lawgiver. With these considerations in mind, he hastens to assure us, "...the laws of physics, which are regarded as the most basic of the laws of nature, are not restrictions on the behavior of matter but rather restrictions on what physicists can do when they invent mathematical models to describe the observed behavior of matter" (p.253).

But this is amateurish philosophy of science: When we look up the weather report for tomorrow, we aren't interested in finding out how meteorologists are constrained to think about the weather—we want to know what the material world is likely to rain down on us! If we ponder what Stenger is saying here, the implications are astonishing and must be completely unacceptable to any scientifically oriented person.

Why is Stenger's assertion—that laws of nature tell us nothing about how the physical world is going to behave—unacceptable? To make it vivid, consider my mother, who is a little nervous about flying. Suppose she wants reassurance that the aeronautics engineers who designed the plane understood and applied the laws of physics, so she can be reasonably sure that the plane will take off, fly and land safely. Now Stenger tells her that the laws of physics constrain the way those engineers think, but they actually don't tell us anything about the behavior of matter! Is that going to make her want to get on the plane? Of course the laws of nature constrain the behavior of matter and, what's more, this behavior is law-like and orderly—if it were chaotic, we could have no reasonable expectations of anything, and where would that leave science?

Moreover, Stenger evidently believes there is no mystery involving our ability to comprehend the laws of nature because, given the empirical data and considerations of coordinate-independence (what he characterizes as “point-of-view invariance”), the laws of physics have to be the way they are. But this is more shoddy philosophy of science. As Gordon McCabe explains:

When one asks the question, 'Why does the universe possess the laws of physics that we observe it to possess, and not some other possible laws?', one has in mind, as an alternative to our own world of empirical data, other sets of empirical data satisfying different laws. To argue that the laws of physics are the way they are, because the empirical data and coordinate-independence has constrained them to be such, is to misunderstand the problem at hand. (McCabe, 2009)

Traditional atheism/materialism argues that we don't need an explanation for why the universe possesses the laws of physics we observe—any set of laws would be equally likely or unlikely—and it's just an arbitrary matter of fact that the universe is the way it is. While this argument ultimately doesn't work, it is interesting and at least *prima facie* intelligible. It doesn't work because, among other reasons, a compelling rebuttal is inherent in the fact that we can comprehend the laws of nature and the orderliness implicit in them.²⁷ Stenger's scientific-sounding ramblings do nothing to undermine the force of these considerations based on the comprehensibility of the laws of nature. And if Stenger had exercised an ounce of the skepticism he claims to have, he would himself have realized that nothingism contributes nothing to the debate beyond the principles of traditional atheism/materialism.

Conclusion

In the final analysis, what should we say about *Quantum Gods*? Would it be too severe to classify it as pseudoscience? Stenger categorizes himself as one of the “new atheists” but, based on the foregoing analysis, “village atheist” might be more apt. The eminent contemporary philosopher, Hilary Putnam, invented the term “village atheist” to depict a cynical writer who will seem sophisticated only to the unlearned and provincial. Moreover, Stenger's writing is through and through *scientistic*, meaning it invokes the authority of science to support arguments and conclusions which are not scientific at all. And isn't this what Stenger and the other self-styled “debunkers” mean when they characterize an opponent's writing as pseudoscientific?

There's nothing wrong with vigorous debate; indeed that is an essential part of the scientific method. But debating requires understanding and addressing the positions of one's adversaries. Stenger and the other new atheists love to invoke the legacy of the heroes of science—Galileo for example—courageously speaking truth to power by confronting the religious authorities of their time. What they are overlooking is that, for some of today's intellectual elites, materialism and atheism *are* the entrenched religious dogma of our time. Bashing quantum spirituality certainly requires no courage whatever!

A fundamental and recurring shortcoming of *Quantum Gods* has to do with the fact that Stenger really doesn't think the point-of-view of his intellectual adversaries is worth taking the trouble to understand and get right. In order to properly evaluate *Quantum Gods* it is important to realize that Stenger is not trying to contribute to the debate—he is trying to shut off debate. He is setting a belligerent tenor, intended to put anyone on the defensive who dares to suggest that quantum spirituality might deserve thoughtful consideration. Indeed, at least two science magazine editors—Michael Shermer and Amanda Gefer—have readily adopted Stenger's tone and, insofar as they can influence the editorial policies of their journals, they will see to it that no articles taking these issues seriously see the light of day. In the history of science this is the way a prevailing paradigm can obstruct scientific progress, hanging on long after it has served any useful intellectual purpose. These are the dynamics underlying the hostile tone that pervades *Quantum Gods*.

Throughout this review article we have documented the many instances in which Stenger systematically misrepresented the positions of his intellectual opponents and, instead of addressing the tough arguments head on, he changed the subject by setting up a straw man which was easier for him to attack. Hence we find him frequently reverting to his preferred way of characterizing the debate as a simple matter of science versus superstition. Once having defined *this* as the issue, all he needs to do is assume the attitude of an outraged scientist and heap on the ridicule.

The real reason Stenger and like-minded debunkers consistently fail to address the tough arguments head-on is because those arguments, if forthrightly addressed, don't yield to facile resolution. If he had done his homework and gotten his opponents' positions right, he would have discovered that it is harder to dismiss quantum spirituality than he had imagined. Indeed, the more carefully—and yes, critically—one considers the issues, the more one finds quantum spirituality to be eminently worthy of serious consideration, as a plausible and measured approach to the most long-standing and intractable questions at the basis of science.

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¹ All Stenger references are to *Quantum Gods*, (Stenger, 2009).

² Shermer, who like Stenger considers himself to be a professional skeptic, invoked the “quantum flapdoodle” epithet in his *Scientific American* critique of *What the Bleep*, entitled “Quantum Quackery” (Shermer, 2005). He particularly targets the Hameroff-Penrose model of quantum consciousness. Hameroff’s response, “Hackery/Quackery in *Scientific American*,” addresses Shermer’s objections, and concludes with the advice to “lighten up!” Thus Hameroff writes, “*Whatthebleep?* is entertainment. Lighten up! The early animations of Jules Verne’s moon landings were crude by later standards, but planted the seed of a wonderful idea in popular culture.” (www.quantumconsciousness.org/hackery.htm). This is a link to Stuart Hameroff’s pages.) Evidently, Shermer hasn’t taken Hameroff’s advice.

³ For a balanced discussion of psychic phenomena, see Alcock, Freeman, and Burns (2003).

⁴ An analogy frequently used by Maharishi to illustrate his Vedic conception of consciousness invokes the simple image of waves on the ocean. The ocean represents universal consciousness and individuals who appear to be separate and distinct on the surface are, like the waves, integrated at the deeper levels. Jonathan Shear extends this analogy by noting that, while the weather for hundreds of miles around is dependent on the ocean in the vicinity, it is not due to any single wave. The latter would be a metaphor for “solipsism”, but not the former. Accordingly, it is universal consciousness that creates reality; it is not we, as individuals, who create reality. It is important to note, however, that according to Maharishi we can become more integrated with the universal aspect of our consciousness—we can become more *enlightened*—and this will allow us greater support from the laws of nature than an individual can ordinarily expect to have. Given Stenger’s materialistic bent, it is not surprising that he would be antithetical to Maharishi’s conception of enlightenment; but unfortunately, he does not so much critique Maharishi’s conception as jeer at it, as we will see.

⁵ For example, according to Newton’s calculations, the planetary orbits are inherently unstable and divine intervention is necessary in order to keep the planets in their orbits. Newton proposed that God periodically intervenes by sending a comet through the solar system in order to adjust the planetary orbits as needed! The fact that Newton’s calculations were subsequently corrected by Laplace does not affect the philosophical point that Newton himself thought that something more than mechanical clockwork was involved in the functioning of our universe. The implications of this example for theology are discussed in

(Lindberg and Numbers, 2008, p.83 ff). Newton himself regarded science as providing explicit support for theology: “This most beautiful system of the sun, planets, and comets could only proceed from the counsel and dominion of an intelligent and powerful Being....” *Principia Mathematica* Book 3 (1687).

⁶ Stenger has a ninth book now available for pre-order on Amazon, entitled *The New Atheism: Taking a Stand for Science and Reason*.

⁷ Philosopher Ezio Vailati explains Leibniz’s understanding of divine providence in the context of deism: “Leibniz also reproaches Newton for claiming that things need correction by extraordinary divine concurrence in the world’s machine. He claims that divine providence is not eliminated but confirmed by the fact that in the world’s machine everything occurs by preestablished design without the need of any correction, since it entails that God has foreseen and predetermined everything.” (www.siu.edu/~evailat/lz-cl.html . This is a link to Ezio Vailati’s pages. He’s a Professor of Philosophy at Southern Illinois University)

⁸ There is a long tradition in ethics and the philosophy of mind that freedom is an essential characteristic of mind. If our thought and action were determined by external constraints then we would not be morally responsible for our bad behavior and, likewise, we would not be responsible for whether or not our thinking is logical and coherent. If our minds were dependent on deterministic physical processes, these would seem to be external constraints of the objectionable kind. Materialism has long had to contend with these objections and has never found an adequate response. Moreover—and this is the key point for Stenger’s misunderstanding of Penrose—freedom does not mean randomness. If our thought and action were determined by random processes it would still not be free in any way that would support moral responsibility or intellectual coherence. Evidently, freedom means freedom from *any* external constraints, whether these are deterministic or random. See (Scharf, 2009) for an extensive analysis of this issue. In this context, one can appreciate the insightfulness of Maharishi’s proposal that, at its deepest level, consciousness is self-referral, which implies that it is not dependent on anything external.

⁹ Timothy O’Conner and Hong Yu Wong, writing for the on-line *Stanford Encyclopedia of Philosophy* (<http://plato.stanford.edu/entries/properties-emergent/>) distinguish “epistemological emergence” from “ontological emergence.” Ontological emergence would involve irreducible physical properties of the whole, and would correspond to what Stenger is referring to as “holistic emergence.” Epistemological emergence has to do with our holistic conception of ensembles, and the epistemological aspect of epistemological emergence has to do with the meaning we ascribe to our descriptions of ensembles—how we understand and think about those ensembles. Hence, although epistemological emergence is compatible with reduction, it ultimately involves consciousness and mind. Stenger’s conception of “reductive emergence” seems to be an untenable blurring of epistemological and ontological emergence.

Thus consider Stenger’s last sentence in this passage:

Summarizing, in the case of reductive emergence we have new principles appearing as systems become more complex. These principles do not apply at the lower level of particle interactions. Yet they are fully reducible to particle mechanics and nothing more. (p. 159)

If he escapes conceptual incoherence by invoking consciousness as the receptacle for qualia, he cannot then say that the emergent principles “are fully reducible to particle mechanics *and nothing more*.” Likewise, he cannot legitimately conclude that “Emergence is just a name for the evolution of complexity out of simplicity, no doubt a notable phenomenon and little doubt that *it arises purely from particles of matter*” (p. 161, emphasis added). Given the irreducibility of consciousness discussed previously in terms of the “hard problem,” which Stenger completely ignores, there is no validity to his claim that emergence arises purely from particles of matter.

¹⁰ In this discussion of emergence—including what emerges and for whom it emerges—I’ve emphasized the sharing of qualia/appearances between consciousness and the external world, because this is the

customary way of framing the problem of macroscopic reality. But similar considerations apply to relational mathematical properties, such as equality and inequality. Take synchrony—equality of a pattern of behavior in time—for example. Two particles might be vibrating in synchrony, where their synchrony could be characterized as an emergent property arising from the individual vibratory patterns of the two particles. Is the mathematical relation—the equality—a holistic property of the physical particles, something in the consciousness of the scientist describing the phenomenon, or an abstract property which interfaces the observer and the observed? Further exploration of these questions from the philosophy of mathematics is beyond the scope of this paper, but it is interesting to note that the ambiguity regarding mathematical relations parallels the ambiguity inherent in qualia.

These same issues, concerning the subject/object ambiguity inherent in holistic phenomena, are embedded in Niels Bohr's famous complementarity principle. Although he initially developed complementarity to help account for the wave/particle duality, Bohr regarded the complementarity between subject and object as the most fundamental expression of the principle. This is exemplified by his well-known "Blind Man and the Stick" analogy: Suppose a blind man uses a stick to orient himself in his environment. When he holds the stick loosely, he regards the stick as an external object—a part of his environment in which he needs to orient himself. But, if he holds it firmly, he regards the stick as an extended part of himself, giving him information about his environment. Whether the distinction between the blind man and his environment begins at one end of his stick or the other is arbitrary. This subject/object ambiguity, of the blind man's stick, is a metaphor for the subject/object ambiguity inherent in the world as we ordinarily experience it.

We began this paper with a review of the radical demarcation between consciousness and matter that dominated the classical worldview (since at least the time of Rene Descartes). The complementarity principle embodied Bohr's recognition that this classical demarcation was an overly simplistic idealization, and one that has proven unsuitable for the increasing precision and refinement of quantum physics. The intertwining of consciousness and matter is at the basis of the orthodox interpretation of quantum mechanics and is essential to understanding Bohr's thinking about the problem of quantum measurement. These issues in relation to Bohr's complementarity principle are sorted out in a thorough and insightful manner by Henry Folse (1985): *The Philosophy of Niels Bohr: The Framework of Complementarity*.

¹¹ This linkage can be challenged, of course, but it has considerable *prima facie* plausibility, and not just because traditionally materialists have favored a reductive/atomistic view of reality. At higher levels of wholeness and complexity, life, intelligence and purpose arise, suggesting that consciousness is associated with increasingly integrated and holistic levels or organization. Moreover, consciousness seems to be distinctively characterized by wholeness. Thus, perception is characterized by integrated, Gestalt experience, and we think and understand by subsuming particular instances under increasingly abstract and general principles. Immanuel Kant famously articulated the doctrine of the unity of consciousness and, in contemporary philosophy, Bayne and Chalmers (2003) emphasized the central role of subsumption in consciousness. Stenger appears to acknowledge this point, which is why he links his materialism with reduction to atomistic particles. But then he should have been more concerned about the wholeness implicit in entanglement and other quantum phenomena.

¹² In technical terms, Stenger has switched from talking about ontological reduction (reduction to atom-like particles) to talking about law reduction (involving derivation from basic quantum mechanics). These are not equivalent, since whether the basic laws of quantum mechanics incorporate aspects of wholeness—and whether these holistic features imply consciousness and spirituality—is precisely the issue.

¹³ In the context of a later chapter, Stenger acknowledges that Hagelin is a "respected physicist" but, as we will see, he couldn't bring himself to leave it at that!

¹⁴ Flipped SU(5) had been contemplated by Stephen Barr and by Dmitri Nanopoulos, but the enduring "gauge hierarchy problem," among other issues, had prevented its being given serious consideration. Hagelin's derivation provided a set of uncomplicated formulas that resolved this problem by basing flipped SU(5) on the deeper-level superstring. After Hagelin had worked out his formulation he faxed his results to

his erstwhile collaborator, Dmitri Nanopoulos, and enthusiastically scrawled on the top of the fax, “Isn’t this the prettiest GUT you’ve ever seen?” This derivation was first presented in Antoniadis, Ellis, Hagelin and Nanopoulos (1987) and in more detail in Campbell, Ellis, Hagelin, Nanopoulos, and Ticciati (1987), and its implications worked out in numerous subsequent papers with these and other collaborators. Over the next several years, the four principle collaborators, Hagelin, John Ellis (head of the theory division at CERN), Nanopoulos and Ignatios Antoniadis, met together for several intensive conferences to work out the implications of the theory.

¹⁵ Maharishi International University was established in 1971. In 1995 MIU officially became Maharishi University of Management.

¹⁶ Quoted in (Dickie, 1992).

¹⁷ This effect, called the Maharishi Effect, has been recorded in peer-reviewed research since the early 1970s. At least sixty papers substantiate the effects of individuals or groups practicing the Transcendental Meditation or advanced TM programs on conflict-related variables or other social indicators of the larger society’s quality of life. See <http://www.truthabouttm.org/documentFiles/20.doc> for a summary of this research. Hagelin argues that the Maharishi Effect represents substantial evidence for the proposed identity of the unified field and the deepest level of consciousness.

¹⁸ See, for example, (Hagelin, 1998), especially chapter 3, and (Oates, 2002) for good, readable introductions. (Hagelin, 1987) is a classic statement of the Maharishi-Hagelin identity principle, but not light reading. (Maharishi Mahesh Yogi, 1984), is a compilation of press reports from the early-1980’s when Maharishi first explicitly associated Transcendental Consciousness with the unified field of physics and the Transcendental Meditation program was presented as the Maharishi Technology of the Unified Field. Maharishi designated 1984 the “Year of Unified Field Based Civilization,” as the organizing theme for the global Transcendental Meditation organization. For online source materials, www.tm.org and www.mum.edu would be the best places to start.

¹⁹ Stenger gives no references for his claim that Maharishi associated the TM program with grand unified theory in general, or with SU(5) in particular. At first I thought that he must have gotten this idea from Geoff Gilpin and mistakenly attributed it to Maharishi. Geoff Gilpin is a disgruntled former student of Maharishi International University, who has recently written a book (Gilpin, 2006) expressing his opinions of Maharishi and the Transcendental Meditation organization. Stenger cites Gilpin’s book which he says he “relied on extensively for parts of this chapter [his ‘Guru of GUTs’ chapter]” (p.56).

But Gilpin (2006) never makes the claim, in his own voice, that Maharishi associated the TM program with GUT, although he quotes Stenger as telling him:

There are a lot of theories of Grand Unification. The simplest one, the one that Maharishi was promoting, made a very specific prediction—that the proton would decay. People set up experiments all around the world and everybody expected to find proton decay, but they didn’t find it. So that Grand Unified theory, the one in Maharishi’s ads, turned out to be false. I found that very amusing. (Stenger, as quoted in Gilpin, 2006, p. 187)

What is very amusing is that, while Stenger cites Gilpin as his authority on Maharishi and the TM program, it was apparently Stenger himself who was authoritatively attributing a TM-GUT connection to Maharishi. In other words, Stenger didn’t get this mistaken and misleading idea from Gilpin, he just made it up out of thin air! So Stenger cites Gilpin as his reference for his GUTs chapter, and Gilpin cites Stenger, and neither of them know what they are talking about.

²⁰ Stenger appears to be disputing the phrase “responsible for,” interpreting this as an unfounded claim for priority and suggesting that his sleuthing has unearthed the *real* discovery of flipped SU(5) in Stephen Barr’s 1982 paper. But Stenger needn’t have worked so hard to rectify the historical record! Stephen Barr’s paper is properly referenced in the 1987 paper coauthored by Hagelin: (Antoniadis, Ellis, Hagelin, and

Nanopoulos, 1987). Moreover, if he had read the title of this paper—“Supersymmetric Flipped SU(5) Revitalized”—Stenger would have known that Hagelin’s claim was to have *revitalized* flipped SU(5). The idea had been considered and shelved by the theoretical physics community until Hagelin’s initial derivation built on the superstring. This—together with the subsequent years-long intensive effort of Hagelin and his collaborators—developed flipped SU(5) into the most promising grand unified theory, which it is to this day. See fn. 14 for more history of flipped SU(5).

²¹ Marginal indeed. In work done at Harvard University, as early as 1970, Robert Keith Wallace found that Transcendental Consciousness is associated with a characteristic set of physiological parameters indicating a fourth major state of consciousness, distinct from waking, dreaming and deep sleep (Wallace 1970, 1995). Since then, more than 600 published research studies, conducted at over 200 independent research institutions in 35 countries, have documented the distinctive physiological correlates and beneficial results of practicing the Transcendental Meditation program. In addition to Wallace, some of the most active researchers have included David Orme-Johnson, Robert Schneider, Charles Alexander, Fred Travis, Ken Walton, Michael Dillbeck, Ken Cavanaugh and Sanford Nidich. For good summaries of the TM research, see: Orme-Johnson (1995), www.tm.org/research and www.mum.edu/research.

For a report on recent research evaluating the effect of the TM program on reducing blood pressure, see [Transcendental Meditation More Effective in Reducing High Blood Pressure Compared to Other Stress Reduction Programs](#). Two recent meta-analyses by Rainforth, et al. and Anderson, et al. document the unique effectiveness of the Transcendental Meditation program for reducing high blood pressure. Rainforth, et al. (2007) shows the TM program is more effective than other stress reduction programs in reducing blood pressure and Anderson, et al. (2008) shows that the TM program is more effective than relaxation or health education controls in reducing blood pressure.

²² For a good discussion of this equivalence claim see www.truthabouttm.org/truth/Research/ComparisonofTechniques/index.cfm. See also Orme-Johnson and Walton (1998) for a summary of the evidence against the conclusion that all meditation and relaxation approaches to preventing or reversing stress are the same.

²³ Alexander emphasized that higher states of consciousness are developmentally higher, in the same way that the more advanced levels of a maturity scale, such as Jean Piaget’s, naturally provide increasingly more accurate and coherent experiences and understanding of the world. In their jointly edited book, *Higher Stages of Human Development*, Charles Alexander and Ellen Langer posed the central question, “What is the endpoint or highest possible state of human development?” (Alexander and Langer, 1990). Why is this question important? Alexander explains, “How one conceives of the highest state or endpoint of human development is critical, for it contains one’s perception of the direction, possibilities, and mechanisms of human growth” (Alexander and Alexander, 2000, p.191). Alexander and his associates documented the evidence for a developmental scale that continues well beyond formal operations to the highest levels of enlightenment. Their research supported the thesis that psychic development, although ordinarily arrested prior to reaching these higher states, can be released by means of transcendental experiences to continue its evolution. Alexander was convinced of the naturalness and universality of our innate tendency to evolve on the basis of transcendental experience. The underlying theme of Alexander’s research was to test the premises that there is an innate human drive toward growth, development and evolution; that transcendental experience can remove physiological and psychological obstacles to the fulfillment of this natural tendency; and that the end-state of this evolutionary process involves the ability to maintain transcendental experience, not as a temporary, “peak” experience, but as a full-time reality. For good overviews of Alexander’s work, see David Orme-Johnson (2000) and Victoria Alexander (2005).

²⁴ Hebert *et al.* (2005). Zero phase-lag synchrony is especially interesting from the perspective of quantum neuroscience, because brain-wave synchrony of nonlocal regions of the cortex is hard to explain on the basis of classical mechanisms.

²⁵ The work of Travis, Arenander and their collaborators builds on earlier work documenting the physiological correlates of Cosmic Consciousness. Mason and Alexander *et al.* (1997) showed that long-

term practitioners of the Transcendental Meditation program reporting witnessing sleep show the signature of Transcendental Consciousness (alpha/theta waves) superimposed on the signature of deep sleep (delta waves).

²⁶ Historically, arguments for a unified “deep structure” (Shear, 1990), underlying both consciousness and matter, have been advanced on the basis of the unreasonable effectiveness of mathematics in physical theory. Shear develops and explains the rationale for the unity and identity of the deep structure of knowledge and the deep structure of the objective world, tracing this perennial idea through its recurrence in both Western science and philosophy as well as Eastern meditative traditions. See also Gorini (1997) for a recent argument by a mathematician in support of this thesis.

²⁷ If the laws of nature were really arbitrary, then the laws governing our intellectual processes—including our scientific method—would also be arbitrary, and science as a meaningful and credible enterprise would be undermined. See (Scharf, 2009) for a more extensive discussion.