Pseudoscience versus science

In his Commentary on the dangers of pseudoscience (PHYSICS TODAY, May 2016, page 10), Sadri Hassani sweeps under the rug the fact that the mind was explicitly introduced into the basic conceptual structure of quantum physics because a link was found between particles being observed and the observer. Several towering figures of quantum physics—for example, Max Planck, Erwin Schrödinger, John von Neumann, and Eugene Wigner—claimed that the consciousness of the observer is vital to the existence of the physical events being observed and that mental events can affect the physical world. Wigner, who received the Nobel Prize in Physics in 1963, wrote, "It was not possible to formulate the laws of quantum mechanics in a fully consistent way without reference to the consciousness."[1]

Hassani cites "Manifesto for a post-materialist science"[2] as an example of the growth of pseudoscience, but contrary to what he pretends, that editorial does not seek at all to equate research on psi phenomena and near-death experiences with quantum physics. *De facto,* the main objective of the manifesto is to present, in a concise and succinct manner, various lines of empirical evidence that strongly suggests that mind represents an aspect of reality as primordial as the physical world.

Mind is fundamental in the universe; that is, it cannot be derived from matter and reduced to anything more basic. Mind and the physical world are deeply interconnected, and mind—that is, will or intention—can influence the state of the physical world and operate in a nonlocal or extended fashion. That is, it is not confined to specific points in space, such as brains and bodies, nor to specific points in time, such as the present. Furthermore, what we are proposing in the manifesto is that, to the great displeasure of Hassani and other pseudoskeptics like him, the consciousness-related interpretation of the quantum measurement problem is consistent with those conclusions and with the emerging post-materialist paradigm. It is not pseudoscience; it is evidence-based responsible science respected by open-minded theorists and experimentalists alike.

References

1. E. Wigner, *Symmetries and Reflections: Scientific Essays of Eugene P. Wigner*, Indiana U. Press (1967), p. 169.
2. M. Beauregard et al., *Explore* **10**, 272 (2014).

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Sadri Hassani, in his Commentary, laments the fact that many of America's top-tier medical schools "house centers of integrative health." He singles out *Explore*, a peer-reviewed journal I serve as executive editor, for special criticism because we published "Manifesto for a post-materialist science," which, he says, "elevates parapsychology and near-death experience to the rank of quantum theory."

That article had nothing to do with equating those areas to the scientific status of quantum theory. However, Hassani appears unfamiliar with developments in which quantum physical concepts such as nonlocality and entanglement have been shown to occur in biological systems. That, we believe, indicates some as-yet-undefined degree of overlap between biomedical science and quantum physics. As physicist Vlatko Vedral states in his 2011 article "Living in a quantum world":

> Quantum mechanics is not just about teeny particles. It applies to things of all sizes: birds, plants, maybe even people. . . .
> . . . Until the past decade, experimentalists had not confirmed that quantum behavior persists on a macroscopic scale. Today, however, they routinely do.[1]

Until the origin, manifestations, and nature of consciousness—science's greatest mystery—are resolved, we shall continue to examine those topics at *Explore* with the same openness advocated by some of the greatest patriarchs of modern physics, including Max Planck, the founder of quantum mechanics, who said,

> I regard consciousness as fundamental. I regard matter as derivative from consciousness. We cannot get behind consciousness. Everything that we talk about, everything that we regard as existing, postulates consciousness.[2]

And Nobel physicist Erwin Schrödinger said,

> Although I think that life may be the result of an accident, I do not think that of consciousness. Consciousness cannot be accounted for in physical terms. For consciousness is absolutely fundamental. It cannot be accounted for in terms of anything else.[3]

References

1. V. Vedral, *Sci. Am.*, June 2011, p. 38.
2. J. W. N. Sullivan, *Observer*, 25 January 1931, p. 17.
3. W. Moore, *A Life of Erwin Schrödinger*, Canto edition, Cambridge U. Press (1994), p. 181.

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The scientific community must formulate more direct countermeasures to address the "societal mental disease" of pseudoscience that Sadri Hassani discusses. Scientists are often perceived as condescending and dismissive of others' points of view. To effectively penetrate

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the passionate claims of pseudoscientific beliefs, it's our duty to dust off our neglected tools of scientific rhetoric.

To constructively counter pseudoscience, I suggest, first, that we not denigrate or belittle its merchants or consumers, and second, that we take time to understand perspectives of the pseudoscience and antiscience audience.

Belittling others with names like "idiot" and "kook" as found on the informational website suggested by Hassani contributes nothing to any conversation. It feeds into the "they don't respect us" narrative of pseudoscience purveyors. Each person comes to us as they are. They may ask, "How does a photon *know* there's only one slit and not two?" in the double-slit experiment. If we snicker at their apparent notion of sentient photons, we miss the fact that they've visualized themselves riding alongside photons as Albert Einstein did in his famous *gedanken* experiments. We earn respect as educators by treating questions as catalysts of intelligent conversations and by empathizing with each person.

Most pseudoscience consumers believe that they've adequately applied the scientific method and that their intuition is subsequently correct. Many are simply misled by rhetorical use of colloquial language. Rather than worrying about misuse of the word "energy" as Hassani does, I'd worry more about the word "wavefunction." The fact that nearly everything in quantum theory derives from this purely nonphysical entity will eventually go viral. We must clearly emphasize that because the physical world is complex and difficult to comprehend, our models and theories shouldn't be carelessly misconstrued.

Let's fine-tune our rhetoric skills. I recommend reading Plato's lively dialog *Gorgias*, in which he concludes that bare rhetoric serves no educational purpose—it merely persuades. Pseudoscientists are talented rhetoricians exploiting natural human frailties such as the desire to be right. Rhetoric cuts to the quick. In the arsenal of pseudoscientists it opens floodgates to dangerously misleading beliefs. Our rhetoric as scientists must be based on meaningful facts and feed into natural human instincts, such as curiosity.

In the 2014 "debate" between Bill Nye, the Science Guy and CEO of the Planetary Society, and Ken Ham, president of Answers in Genesis, Ham's rhetoric was well-packaged: "Well, there's a book for that!" Ham's audience vibrantly applauded. Nye's facts were met with unwavering silence. Behind Ham's curtain is the false narrative that science is divided into "observational" and "historical" knowledge. In his consumers' minds, events of the past cannot be known if we were not there to witness them firsthand, and the Bible represents the firsthand account. We could exclaim, "Well, there *is* the universe for that!" but what compelling narrative does it support?

We must counter the rising tide of destructive pseudoscience by engaging in penetrating scientific rhetoric in public spaces.

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Although I completely agree with Sadri Hassani's warning, I think the philosophical questions that motivate scientists are universal. As physicists, we should respect and celebrate the asking of questions, even as we point out how science and pseudoscience differ in arriving at the answers.

The notion of conscious photons, for example, has a long and fascinating history. One example of a rational question and an answer that we might mock today stands out for its utter charm. French encyclopedist Denis Diderot (1713–84) supported the Greek conception of invisible, indivisible, inert atoms. However, he reasonably pointed out, "To suppose that by placing next to a dead particle one, two, or three other dead particles, one can form the system of a living body amounts, it seems to me, to a flagrant absurdity, or I am grievously mistaken"(reference 1, page 148).

Modern scientists still struggle with the solution to his problem. Diderot took the bull by the horns and simply endowed the atoms themselves with a quality he called sensitivity, on which he based a complicated story of the emergence of life. He explained one consequence of his theory in a letter to his lover Sophie Volland:

> Those who loved each other during their life and have themselves interred side by side are perhaps not as foolish as one might think. Perhaps their ashes come into con-