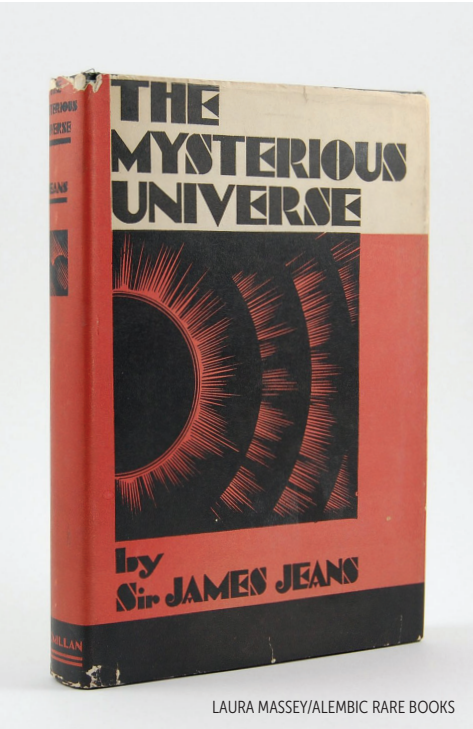
James Jeans's views on the nature of reality

Daniel Helsing's takedown of the views of James Jeans ("James Jeans and *The Mysterious Universe*," PHYSICS TODAY, November 2020, page 36) needs a rebuttal. The view that a real physical universe is "out there"—end of story—misses entirely the benefit of our huge and relatively recent mathematical insights into the nature of what seems to be reality, according to our evolved human senses.

We have achieved deeper insight only through our discovery of the immense power of often astonishingly simple mathematical equations that elucidate the nature of the so-called universe. That is profoundly yet almost trivially demonstrable! I offer an example: I expect Helsing would agree that the most mysterious thing about the universe is the nature not of matter or space but of time.

With Hermann Minkowski's 1908 insight into Einstein's 1905 special relativity, we humans achieved the almost unthinkable: a deep understanding of the utterly simple nature of time. For while $ds^2 = dx^2 + dy^2 + dz^2 + dt^2$ would describe a completely timeless Pythagorean universe having nothing but four space dimensions, Minkowski, bless him (*pace* Einstein), discerned that $ds^2 = dx^2 + dy^2 + dz^2 - dt^2$ actually describes the emptiest parts of *our* universe, which possesses three space dimensions but also has time. Yes, only a minus sign—but our greatest intellectual discovery ever.



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Such equations were created solely because of the existence of the human mind, and they demonstrate that the universe itself is intrinsically mental in its nature. In my 2005 essay "The mental universe," I assist Jeans and Arthur Eddington in the Sisyphean task of educating the public on that point.[1] I also try to assist young students in seeing how simple the math is; for example, I concisely present special relativity at https://henry.pha.jhu.edu/2-pager.pdf.

Reference

1. R. C. Henry, *Nature* **436**, 29 (2005).

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▶ **Helsing replies:** I did not intend a "takedown," as Richard Conn Henry claims, of James Jeans's idealistic interpretation of modern physics. Nor did I express the view that "a real physical universe is 'out there.' " Apart from exploring Jeans's inherently fascinating views and the reactions they provoked, I pointed to the historical dimensions of philosophical interpretations of physics, contemporary views included. I am agnostic on the question of the nature of ultimate reality—I do not know what is out there, and while I am certainly curious, I do not see how I will ever be in a position to know.

I respect and admire any scientist who works hard to advance our understanding of the universe and any popularizer who makes a genuine effort to interpret science philosophically—including James Jeans and the other popularizers I mention. Part of the process is cultivating an awareness of the historical embeddedness of our theories, interpretations, and worldviews, regardless of whether they tend toward idealism or naturalism.

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Nuclear is carbon-neutral

David Kramer stated in his news item "Hydrogen-powered aircraft may be getting a lift" (PHYSICS TODAY, December 2020, page 27) that "to be carbon-neutral, the hydrogen must be produced either with renewable energy or with natural gas equipped with carbon capture and storage." There is one other form of power production that is carbon-neutral and viable for use: nuclear.

I am curious whether Kramer omitted nuclear power by accident or by choice. Too often nuclear power is not considered for carbon-neutral power production, even though existing and advanced nuclear power technologies are widely accepted as carbon-neutral. Any serious discussion regarding either carbon-neutral energy production or hydrogen production should include nuclear power.

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▶ **Kramer replies:** The omission of nuclear power as a carbon-neutral power source was inadvertent, not deliberate.

David Kramer
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TV inspires future scientists

The article on *3-2-1 Contact* by Ingrid Ockert, in the January 2021 issue of PHYSICS TODAY (page 26), provided