

Debate about science and religion continues

I commend Murray Peshkin for his personal involvement in educating the public about science (PHYSICS TODAY, July 2006, page 46). Arming nonscientists with even the most basic scientific reasoning goes a long way in dispelling much of the misinformation propagated by religious fundamentalists. However, I think Peshkin's explanation of boundaries between science and religion is wrong, and even though his education of nonscientists is amiable, his message to the religious among them is condescending.

Peshkin's presentation to religious nonscientists is conciliatory through the claim that science need not overlap with their beliefs, and that they can be safe from scientific scrutiny because science and religion have "different rules of inference, and different definitions of truth or reality." The statement comes without explanation and seems like it is intended to be accepted without question by a receptive audience. Then he writes, "Science is based entirely on experiment," which emphasizes a narrow scope of science and implies ample room for religious belief. This second statement is wrong because it disregards the role of observation, something responsible for astronomy and much of evolutionary biology, to name just two areas. By neglecting to mention observation in this context, he leaves out the essence of science most directly responsible for unease with religion. Specifically, observation means that many religiously motivated claims about nature can be subject to scientific scrutiny even if they are not experimentally accessible; the origins of the universe and of humans are prime examples. Science has cornered religious assertions about the natural world, and

the tension arises not when scientists step over some imaginary line into religion but when religion trespasses by trying to explain the natural world. Any supernatural cause that has an effect in the natural world is subject to validation or refutation by science.

Peshkin does give two examples where science cannot tread: "The world was created three hours ago with all our memories and everything else in place," and "No observational evidence can disprove some subtle supernatural intervention." But those statements are just specific examples of the general rules; we can't know the unknowable, and we can't disprove the existence of something. Peshkin seems to imply that these kind of fantastical ideas are a refuge for the religious, without enlightening them to how extremely small a perimeter it leaves them to roam. He does not show, for example, how this fence surrounding religion means the effectiveness of prayer, existence of the soul, and interaction between a deity and the natural world are subject to scientific scrutiny. Instead, his misrepresentation of science appears deliberately designed to comfort those with beliefs in the supernatural.

My charges present a dilemma for Peshkin and for all of us who want to have an honest debate about science education, health care, medical research, and other avenues in which science and religion have rubbed elbows. Either we run the risk of alienating religious people by explaining how little room science leaves for mysticism, or we treat them like children by sugarcoating our empiricism so they can feel comfortable in their beliefs; the latter stance is often mistaken as respect for religion. Perhaps Peshkin's middle ground is good diplomacy, but it is not completely forthright.

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There is much wisdom in the example Murray Peshkin sets and in the specific topics he mentions. However, as someone who has moved in my career from physics to planetary science to astrobiology, I am sensitive to two

areas in which Peshkin's approach risks sending the wrong message.

The meaning of the word "theory" has evolved over the past century to the point where no one outside of a few academic oases uses its original scientific meaning. Such establishment bastions as the *New York Times* and National Public Radio, and even many scientists in ordinary conversation, use theory to mean an idea, suggestion, or hypothesis. Common are such phrases as "in theory, such-and-such is true, but in practice . . ." or "in the absence of evidence, several theories were suggested." It is certainly possible to explain to a captive audience that the scientific meaning of this word is almost the exact opposite of its colloquial usage. Much better, however, is to talk about gravitation, relativity, plate tectonics, or evolution without the word "theory." We are likely to communicate more effectively if we do not demand that a lay audience unlearn the familiar meaning of this word.

My second concern is the description of science as based entirely on experiment. We must broaden the definition to include observation and inference about things that have happened in the past or are happening in the universe beyond Earth, since those are the topics that generate the most controversy between science and religion.

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The ongoing national debate about the teaching of evolution in our public schools is best served by clearly distinguishing the experimental sciences from the historical sciences like Darwin's theory of evolution. The historical sciences invariably bring into play the totality of the human experience and thus the debate.

Scientists, philosophers, and theologians accumulate knowledge when analyzing different aspects of reality and search for particular hypotheses or models to fit their respective subject matters. Of course, a main goal is to integrate these kinds of knowledge into an all-encompassing worldview.

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