

letters

science majors here entitled "Science and Religion," with what I feel to be quite gratifying results. As is well known, the strong tendency of late for young undergraduates to be turned off to the physical sciences has been complemented by an increasing interest in religious, philosophical and ethical themes. A religious and ethical approach to the study of physical reality (or God's creation if you will) has therefore become a quite natural and desirable path in our attempts to reach these students with the goal of having them understand not only the importance and relevancy of scientific research to their own lives, but also to make them cognizant of the on-going nature of our understanding of the physical world and the positive, personal implications of gaining a qualitative but sound understanding of the current worldview.

Using nonsecular, general concepts of "religion," "metaphysics," and so on as vehicles for the transmission of such knowledge in my own experience works pedagogically and works quite well. Using the motif of "determinism versus free-will" and an historical approach emphasizing the continuous interaction between physical and religious ideas, one can turn these students on to the implications of scientific discovery in particular to quantum mechanics, relativity, bootstraps and cosmology. Ironically, I have found that many of these students have gained a better qualitative understanding of modern physics than some of the physical-science majors.

If anyone else is exploring this approach to the propagation of physical science, I would be happy to enter into correspondence with him.

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Warm ocean?

Conrad Kopala's response (July, page 15) to Clarence Zener's vote for a "somewhat warmer ocean" deserves a rejoinder.

First, there is a vast difference between Kopala's assigning of an "implication" to Zener's statement, when it is more likely that it is an "inference" contributed by Kopala himself. As often happens, one man's inference is not necessarily another man's implication.

Second, there is a vast difference between the likelihood that "climate in the temperature (*sic*) zones would be warmer" and Kopala's abhorrence of hot weather. One need only reflect on the climates that would prevail along the US Atlantic coast and the Norway-Sweden peninsula if the Gulf Stream

were not to exert its stabilizing influence on the climates of both areas. Both areas are warmer; neither features "hot weather."

We know enough about the physics of water bodies as a heat sink to appreciate the thermostatic role oceans can play. It is more likely that a warmer ocean would reduce the extremes of heat and cold, narrowing the overall range by stabilizing fluctuations of temperature.

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Antimatter UFO's

In view of the large number of UFO's that have been reported recently it appears worth suggesting that some of the phenomena that have been designated as "flying saucers" could possibly be sightings of small specks of antimatter in the process of annihilation in the earth's atmosphere. A number of recently reported facts about electron-positron reactions indicates that such a possibility should not be automatically ruled out on the assumption that antimatter could not exist long enough to ever reach the earth's atmosphere.

Specifically, the existence of elastic scattering in some positron-electron collisions shows that not all direct collisions between matter and antimatter lead to a reaction. Added to this, the very small reaction cross sections of positrons with electrons makes it conceivable that actual atoms or molecules of antimatter (the properties of which are now unknown) could have a lifetime on the order of several minutes or more in the earth's atmosphere, and a very long lifetime in outer space. Also there appears to be, during the course of a series of annihilation reactions, an asymmetric formation of hadrons having significant momenta, which could result in the speck of antimatter undergoing gyrations comparable to Brownian motion while emitting enough photons to be visible over a considerable distance. A display of these characteristics could account for some unpublished photographs of objects purported to be "flying saucers."

Should the occurrence of such "UFO's" actually result from the intrusion of specks of antimatter into the earth's atmosphere, a study of the times and places where they have appeared might indicate regions of space where such specks are more prevalent, thus we could be better prepared for their appearance and better able to study their reactions in the atmosphere.

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