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letters

able. As far as I can tell, the answer involves the nature of historical Christian dogma and the personality types attracted to it. Historical Christianity is a religion based on guilt, the fear of external damnation, and the idea of vicarious atonement. In psychological terms the terror of sexual guilt centered around the Oedipus complex becomes associated with the external damnation of the soul. This fear and terror is covered by belief in historical Christian dogma which promises absolution via the sacrifice of Jesus. A person possessed by such a belief system (and possession here may be taken in the sense of demonic) will attack anything which tends to throw doubt on his belief. The historical Christian is not able to relax and enjoy life, and to allow others the freedom of different beliefs undermines the rigidity of dogma. As I see it, this is what we dealing with in the creationist/evolutionist debate.

BURTON H. VOORHEES
Athabasca University
Edmonton, Alberta, Canada

8/82

Reference

1. M. Kline, *Mathematical Thought from Ancient to Modern Times*. Oxford University Press, New York, 1972.

This is in answer to G. F. Albrecht's scathing attack (July, page 15) on those who cannot accept the theory of evolution as the origin of life. As a Christian, I can accept any method of creation, including evolution, because God can create through any method that He wishes. As a scientist, I cannot accept a theory that proposes, without any experimental verification, that life arose by chance, violating the laws of thermodynamics and the law of probability. Experimental verification of any theory must be provided.

The theory of evolution is a catalog theory in that all evidence is based upon observation, cataloging those observations, then developing a theory to explain the items in the catalog. There is no experimental evidence of one species evolving into a new one by chance; all changes that occur are variations of a theme within a species. A theory that life was created also agrees with the data in the catalog and does not violate physical laws which have been demonstrated to be true.

I am not defending those who call themselves creationists, as many of their positions are non-biblical and serve only to distract from God's plea to us to walk in His way; however, I am a scientist and will oppose vigorously any effort by Albrecht or others to impose their religious position (blind accep-

tance of a theory which has not been experimentally verified) through the use of the scientific organizations to which I belong and pay dues.

There is one aspect of the almost hysterical insistence by the evolutionists that their theory be accepted as fact that greatly concerns me. If evolution is occurring, that implies that some humans are more highly evolved than others. Who are those more highly evolved? How would they arrange society to handle those who are not as highly evolved? Who decides the state of evolution of each individual? A repeat of the historical answers to these questions makes me shudder. I pray that the "reason" that Albrecht wishes to prevail doesn't.

ROBERT L. DUNNING
Petroleum Sciences, Inc
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8/82

This letter is apropos of the APS stand on creationism and Lincoln Wolfenstein's letter in April (page 95) stating that advocacy of creationism is part of a "well orchestrated anti-intellectual campaign, . . . resembling those of Hitler and Stalin."

As a physicist, my training has not equipped me to decide on the correctness of the theory of evolution. However, in your May issue there was an article reporting evidence which confirms the idea that a large meteorite hitting the Earth caused a major wave of biological extinctions. Recently a book by Francis Crick, a winner of the Nobel Prize in biology for the discovery of the double-helix structure of DNA, proposed that life on Earth originated from a space ship, visiting from somewhere in outer space. There do then appear to be a large number of people, qualifying as "intellectuals," who deviate from the standard (synthetic) theory of evolution which, as I understand it, states that life arose spontaneously in some kind of primeval organic soup and developed into its present form by continuous selection of advantageous mutations. Further I believe that Wolfenstein's characterization of the Bible as "mythical" and his denigration of President Reagan's economic program do not belong in PHYSICS TODAY, which is a journal of physics.

ALVIN RADKOWSKY
Tel-Aviv University
Tel-Aviv, Israel

8/82

Telescope misrepresented

I am writing about an error in the figure caption on page 56 of the June issue.

The fine-error sensor, or star-tracker, of the International Ultraviolet Explorer (IUE) is only sensitive in

the visible-light range of the electromagnetic spectrum. The image presented on page 56 was therefore of visible light rather than of x rays as mistakenly stated.

I hope that this will clarify matters for those readers who might have wondered why a telescope designed for ultraviolet observations might be guided by a fine-error sensor operating in the x-ray region. The IUE obtains observations in the spectral range about 1150–3200 Å but not in x rays.

YOJI KONDO

Goddard Space Flight Center
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6/82

States of matter

Frederic Kahn's excellent article (May, page 66) makes it easy to understand his enthusiasm for liquid crystals. But to identify liquid crystals as the fourth state of matter unfairly elevates them over others studied by readers of *PHYSICS TODAY*. I presume the first three states of matter are solids, liquids and gases. Surely plasmas, which account for more than 99% of the solar system's mass and are used in fluorescent lighting, spark ignition of gasoline engines, and so on, have a stronger claim on fourth than liquid crystals. The stuff of neutron stars, black holes, and superfluid helium II is clearly not solids, liquids, gases or plasmas in the usual meaning of those terms and thus must also be counted as other states of matter.

JAY S. HUEBNER

University of North Florida
Jacksonville, Florida

6/82

THE AUTHOR COMMENTS: Jay Huebner points out that there are other states of matter which do not fit neatly into the three categories of solids, liquids, and gases. While it might be interesting to select rationally the "fourth state," we would first have to agree on a set of objective criteria. Perhaps another reader would wish to propose some. I'll merely summarize here a few qualifications of liquid crystals.

Liquid crystals flow and take on the shape of their container—a property of liquids—but have a long range (orientational) order—a characteristic of solids. They may also have positional order in one or two dimensions—also characteristic of solids. Hence the widely used designation mesophase.

As for abundance, thousands of known organic compounds have liquid crystalline phases, including soaps and nonionic detergents used every day by readers of this journal. Some authors estimate that as many as 5% of all organic compounds exhibit liquid-crystalline behavior.

Not incidentally, liquid crystals have biological significance. Quarternary

phase diagrams involving liquid-crystal phases play an important role in understanding the origins of atherosclerosis and gallstones.¹ Cells and tissues are often liquid crystals or close analogs.²

Liquid crystals stand between the isotropic liquid phase and the strongly organized solid state. Life stands between complete disorder, which is death, and complete rigidity, which is death again.¹

References

1. D. G. Dervichian, *Mol. Cryst. Liq. Cryst.* **40**, 733 (1977).
2. Y. Bouligand, "Liquid Crystals in Biological Systems" in *Solid State Physics*, Supplement **14**, 259 (1978).

FREDERIC J. KAHN

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7/82

Physicists and nuclear war

I was very pleased to see your June editorial (page 112) urging *physicists* to get involved in teaching the technology of nuclear war to students and the general public and calling on them to exchange relevant teaching materials via the Nuclear War Education Project of the Federation of American Scientists. However, I believe that many universities and colleges will find it difficult to offer a full, regular course devoted just to the science and technology of modern destruction. Such a course, to be viable, must be truly interdisciplinary, offering economics, history, political science, sociology, and so on, and is best taught by interdisciplinary faculty teams. Such teams exist potentially on many campuses, but it is difficult to draw them together and supply appropriate teaching materials. A "bridge" between science and non-science faculty concerned with the problem of nuclear war appears to be required, as is a link between such teams on different campuses throughout the nation (and the world?).

In the hope of creating such bridges and links, a group of faculty from different universities across the nation, all of whom participated in the nationwide Convocation on the Threat of Nuclear War last November, have organized a new organization: "United Campuses to Prevent Nuclear War" (UCAM for short, based in Suite 1101, 1346 Connecticut Avenue, Washington, DC 20036). Consisting of scientists and nonscientists, we are collaborating with scientist groups, such as F.A.S., U.C.S., and P.S.R., to initiate and produce materials for courses and campus convocations. (We have already participated in the convocations of 22 April on the economics of the nuclear arms race, held on over 300 campuses

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