

continued from page 15

In this search for big and preferably expensive projects, we have alienated not only the public at large but also good young physicists. During my own six years in graduate school, I saw some promising graduate students leave physics to do computer science. Their decisions were not based entirely on the job market.

Acknowledging these problems does not solve the problems of unemployed PhDs in physics. Nine years ago, my personal solution was to exit mainstream physics (as many others are doing now), even though at that time it would have been possible for me, with some effort, to stay on. I joined the faculty of a small college, ignoring the opinions of well-wishers who were certain that I was throwing away a promising career. But I have never regretted that decision. Now I do "cheap" research on topics of my own interest. Because of significant teaching responsibilities, my research progresses slowly. This I don't mind, because teaching physics (in particular to nonphysics majors) is exciting. Unlike what one of the YSN members feels, I think it is important to educate youngsters about the excitement and usefulness of physics. Doing so will ensure that we have not only a more practical set of future physicists but also a set of nonphysicists who have a more positive attitude toward physics.

TARUN BISWAS

*State University of New York
College at New Paltz*

5/93

I have rarely been so saddened as I was when I read Alexander Weissman's letter in the May 1993 issue (page 11). As a preservice high school physics teacher, I am in the process of becoming one of those people who asks young students how lasers work and why the sky is blue. To read of a frustrated PhD in physics blasting the recent awareness of the inadequacy in science education makes my heart ache. Weissman cites the "nation's true attitude toward science." Although I agree that this attitude could definitely use some major improvements, how can we expect to change this attitude if we do not educate our youth about science? They are the future politicians, industry bosses, voters and parents. Without sufficient scientific literacy, competency and curiosity, our society will surely decay. We need the creative and intellectual muscle that science builds to survive in these difficult times as well as to satisfy one of our basic human needs: to explore the unknown and try to

understand it.

Granted, the job market, especially with defense cutbacks, is extremely tough right now. This reality is not limited to PhDs in the sciences. Yet in our rapidly changing global economy, it seems that the only way we are going to succeed is to develop our scientific resources, including our future scientists. I'm investing my life in this endeavor. I also have no guarantees that I will have employment come graduation day, but the prospect of helping to expand young minds and make a difference in the world is enough of an incentive to keep me reaching for the stars.

KATHARINE HAMILTON

Oxford, Ohio

5/93

Does Turbulence Toss the Cosmic Background?

In the July issue of *PHYSICS TODAY* (page 13), complicated answers are given to a simple question. Robert J. Yaes (March, page 13) had asked why the cosmic microwave background, as measured by the Cosmic Background Explorer, does not constitute a privileged reference frame, in contradiction with relativity.

The universe is filled with a gas of photons, much as Earth's atmosphere is filled with a gas of molecules. Does the weather bureau's measurement of wind velocity contradict relativity?

An interesting question is whether the microwave background, like the atmosphere or ocean, is subject to turbulent motion. The 10- or 20-light-year sample available to us exhibits uniform motion. But would observers millions of light-years apart and servoed to be in inertial frames at rest with respect to one another all measure the same velocity with respect to the microwave background?

EUGENE SALAMIN

*Coherent Inc
Palo Alto, California*

7/93

Einstein-Bohr Debate Still Unresolved

Upon reading the letters concerning the "border between quantum and classical" (April 1993, page 13), I was struck by the fact that the debate between Einstein and Bohr is still alive. In that debate, the conservative (Bohr) insisted that the "quantum object" is not observed directly but influences an "apparatus" that

records the data in a "classical" fashion. The revolutionary (Einstein) insisted that when a complete quantum mechanical theory was formulated there would be no need to include a "classical apparatus" limit as an essential ingredient in the theory. Quantum theory would then stand on its own. The notion that Einstein wished to return to a classical view is a myth. However, Einstein was unable to carry out his own theoretical program.

Bohr won the debate in the laboratory, and the notion of a classical apparatus is still put "by hand" into quantum mechanics. It is unlikely that playing with reduced density matrices for the quantum object will resolve the issue, since in averaging over the "classical environment" one is throwing away the experimental data (in the sense of Bohr). It is also unlikely that any issue will be settled by theory.

What is required for progress is an experiment in which the Bohr view fails! Anything else is merely bad philosophy. Such an experiment does not at present seem to exist.

ALLAN WIDOM

*Northeastern University
Boston, Massachusetts*

6/93

Don't Alter Courses for Women, Minorities

As a former college physics teacher, I strongly sympathize with the goals of the Introductory University Physics Project and admire the careful and systematic way the group is proceeding. However, I was distressed at the implication, early in the article on the IUPP (April 1993, page 32) that "science courses must meet the needs of new student groups—women, previously underrepresented minorities, new immigrant groups." These students have the same "needs" relative to physics as the traditional white male constituency—understanding, appreciation and skill. To believe otherwise is to set these students up for a self-fulfilling prophecy of second-class citizenship in the scientific community.

Because the article had no further mention of course design based on ethnic group or gender, I hope that the phrase was just decorative boilerplate! Good luck to the IUPP group in its important and difficult task.

ELLEN D. YORKE

*George Washington University Hospital
Washington, DC*

4/93

THE ARTICLE'S AUTHORS REPLY: We agree wholeheartedly with the central concern expressed by Ellen D. Yorke. No physics student should be rendered a second-class citizen by virtue of compromised expectations.

The members of the IUPP steering committee, like most American physicists, recognize that their profession is populated largely by white males. From the beginning of IUPP, we considered it important that the project promote curriculums, textbooks and classroom environments that are free of any influences that might keep students from achieving their full potential. At the same time, steering committee members were painfully aware of how little is really understood about how such influences are to be neutralized.

The IUPP evaluation program was designed primarily to address issues related to course content and methods of presentation. However, during interviews and journal keeping, students have often spoken about critically important issues that influence career choices—such things as childhood experiences, parental and societal values and expectations, peer influences, put-downs by instructors, and sexist or racist attitudes in high school and on college campuses. As we collect, correlate, analyze and publish these student commentaries over the next year or so, we hope to help our current, rather homogeneous population of physics instructors to better understand the experiences and perspectives that students of various stripe bring to the course.

ROSANNE DISTEFANO
The Bunting Institute

Cambridge, Massachusetts

DONALD F. HOLCOMB

Cornell University

Ithaca, New York

JOHN S. RIGDEN

American Institute of Physics

College Park, Maryland

8/93

Restore Shelved Library Funding

Ralph E. Gomory's article "Goals for the Federal Role in Science and Technology" (May 1993, page 42) is timely, not only because of the new Administration but because of the shift from a cold war economy that happened in spite of a lack of leadership, planning and setting of objectives.

In discussions of support for basic science, especially for individual scientists, one of the great omissions has been attention to the library services that researchers rely on for the

preparation of research hypotheses and designs. In Vannevar Bush's day, major libraries had more or less kept pace with publication; regrettably, the libraries have slowed their growth, while the increase in science literature, as is easily confirmed by a look at *Physics Abstracts* and similar records, continues unabated.

There are several reasons for the deterioration of library quality, the main one being the research community's lack of attention to the funding of its major research library collections. According to statistics recently published by the Association of Research Libraries,¹ universities have decreased the libraries' share of their budgets systematically for over a decade. Hundreds of millions of dollars of "indirect" funding of Federal research grants justified by library services have been used for other purposes. When Congress reviewed funding of libraries under the Higher Education Act of 1965, no representatives of the research community offered any testimony. As a result, Congress followed the recommendations of librarians and in 1992 deleted the portion of the act that had once increased college library collection development funds by well over 10%.

The librarians seem to desire an environment where there are no books and journals to catalog and put away—only computers to turn off and on. Where Bush's generation could find nearly every journal of interest on the shelf, future generations will be forced to "browse" by computer—the equivalent of looking through a keyhole—and will miss important articles that are related only by insight and inspiration.

Therefore, if any goals of excellence and competitiveness are adopted, the work must begin, like research, in the library, with the restoration of Federal funding and the provision of departmental subscriptions (called "duplicate" by librarians) to important journals as well as the archiving of comprehensive coverage in the main collections.

Reference

1. A. M. Cummings *et al.*, *University Libraries and Scholarly Communication*, Assoc. of Res. Libraries, Washington, D. C. (1992).

ALBERT HENDERSON
Bridgeport, Connecticut

6/93

Tritium's 'Perverse' Presence in Nature

Many involved in environmental monitoring research will be mildly amused by the declaration in the May

1993 Washington Reports story (page 53) that "tritium is not normally found in nature." Nature is perverse, and to confound the presumption that a short-lived nuclide would not be present she invented cosmic rays and spallation.

This was a minor error in an otherwise interesting report.

LES SLABACK

5/93

Gaithersburg, Maryland

Atmospheric Heating and Hubble's Lifetime

Greg Davidson (May 1993, page 91) wrote some interesting comments about solar activity cycles, but they were irrelevant to the central premise of my letter (October 1992, page 142): that if the atmosphere has been heated, data should exist that may help decide the question. Also, in his last paragraph, Davidson made an unfortunate comment that may be clever but is irrelevant and even untrue.

To quote Davidson directly, "Kepros refers to NASA's announcing that [the Hubble Space Telescope's] lifetime would be truncated from 15 years to 5 because 'the atmosphere had expanded' and then mysteriously withdrawing that announcement." Please note that nowhere in my letter was the word "mysterious" used. Only the fact of the withdrawal was stated, and in my mind there is no mystery whatsoever. On taking office in 1981, President Reagan's Administration announced that security control of technical data would be greatly increased. Orbital technology was one of the areas that were especially targeted for upgraded security classification. The succeeding Bush Administration's position on the environment is well known too.

The question was and is whether atmospheric expansion due to global warming calculated from the ideal-gas law agrees with present data-based models. The physics is simple, and I calculate the change to be 1.488 kilometers for a spherical shell 480 km thick when there is a mean temperature change from 300 to 301 K. Are data available? NASA, in cooperation with the US Air Force, has published such data in the past, in the volume "US Standard Atmosphere Supplements, 1966." A similar document is available for 1977. There is no later similar document issued by NASA or USAF.

Whether errors associated with such models make the numbers meaningful is a separate problem.