dictions of QCD are actually the predictions of pseudo-QCD models that are mixtures of the perturbative QCD and arbitrary assumptions about hadronization. A good example of the claim of verifying QCD based on such pseudo-QCD models is the well-publicized claim of the discovery of gluon jets in e^+e^- annihilation.[1] The sensitivity of this claimed discovery of gluon jets on the underlying assumptions of hadronization has been pointed out and some remedial measurements urged by the author.[2] These remedial measurements can be carried out both in PETRA at DESY and PEP at SLAC, but have yet to be performed. It is clear that the essential step in the process of verifying QCD is not in piling up more predictions based on pseudo-QCD models but rather in the willingness of experimentalists to carry out the objective measurements necessary to reduce the arbitrariness of the assumptions about hadronization. Also the ability of theorists to solve the theory of QCD will eventually become overwhelmingly important in the process to verify QCD.[3] Before QCD is confirmed beyond reasonable doubt, predictions of grand unified theories can only stay at the level of the usual high-risk speculation of some theorists. The best motivation for constructing new accelerators seems still to be their potential for discovering radical phenomena beyond the imagination of theorists. At a time when the costs of future accelerators are approaching the level of small-arm systems for the Pentagon, I believe that an honest view of the present status of high-energy physics theory is not only essential for high-energy physicists, but is also important for the physics community as a whole.

References

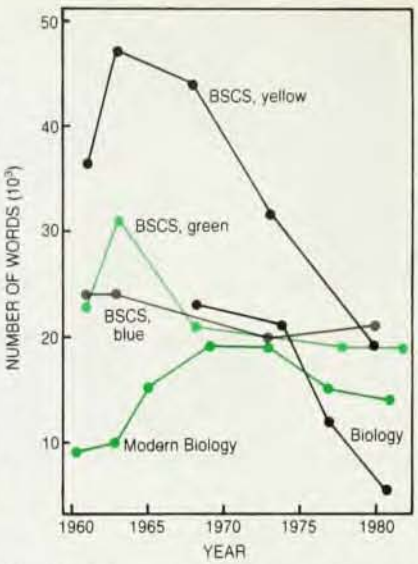
1. PHYSICS TODAY, February 1980, page 17.
2. C. K. Chen, Phys. Rev. **D23**, 712 (1981); "Why the discovery of gluons in e^+e^- annihilation is not reliable," Purdue University Preprint (1981).
3. C. K. Chen, PHYSICS TODAY, May 1982, page 123.

CHIH KWAN CHEN
Glen Ellyn, Illinois

2/83

Creationism once more

In April (page 82) Wayne Newquist asks where "efforts to eliminate the teaching of evolution" may be found. One answer is in our public schools. One needs only to look at the changes made by publishers of high-school biology texts who have apparently yielded to creationist influences in recent years. The accompanying graph is a plot of the number of evolutionary



Number of references to evolution in consecutive editions of five high-school biology texts versus date of publication. *Biology Science Curriculum Studies*, Yellow cover, published by Harcourt Brace Jovanovich (except 1961, by BSCS); *BSCS*, Green cover, published by Rand McNally (except 1982, by Houghton Mifflin); *BSCS*, Blue cover, published by Houghton Mifflin (except 1980, by Heath); *Modern Biology*, published by Holt, Rinehart & Winston; *Biology*, published by Silver Burdett.

words or phrases contained in five major texts over several editions each versus year of publication. These data were collected by Gerald Skoog.[1] Textbook policies requiring qualifications with any references to evolution, such as those of the Texas State Board of Education, sanction this gradual erosion of quality, accurate textbook material. The effect can only be called censorship,[2] since no corresponding deemphasis of evolution has occurred in the life sciences. To draw an analogy, it is as if references to Newton's laws were being removed from secondary-school physics texts. Thus does creationism contribute to poor-quality science education in this country, and public-school students become its victims.

References

1. "Converge of Evolution in Secondary School Biology Textbooks: 1900–1982," Gerald Skoog, Dept. of Education, Texas Tech University, paper delivered to American Biology Teachers' Assn., October 1982.
2. "Censorship of Evolution in Texas," Steven Schafersman, *Creation/Evolution*, Issue X, Fall 1982, page 30.

RONNIE J. HASTINGS
Texas Council for Science Education
Waxahachie, Texas

4/83

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If the creation scientists should win out and we have to begin teaching the Bible in the classroom, physics need not be left out of what has been heretofore a domain of biology. The Flood, for example, offers several simple problems which can be considered at say the high-school level:

▶ Using data from the World Almanac and assuming an average height for the land of 1.5 mi, calculate the total volume of water needed to cover the entire Earth to the altitude of Mt. Everest. (Answer: 972 million cubic miles.)

▶ Using the answer to problem 1 and data from the World Almanac, find the ratio of volume of rain which fell during the Deluge to the volume of water currently in all the oceans of the world. (Answer: 3.09.)

▶ Using the answer to problem 1 and allowing 40 days and nights to cover the Earth, find the rate at which rain must have fallen during the Deluge. (Answer: 5.60 inches/minute.)

▶ If a heavy rain (say during a thunderstorm) is defined to fall at the rate of 2 inches per hour, what is the ratio of the rate of rainfall during the Deluge to that of a thunderstorm? (Answer: 156.)

The teacher is to be discouraged from asking the student to think about such unanswerable questions as: Where did all that water come from and where did it go? How did life forms not taken into the Ark survive submersion under the heavy pressure of 5 miles of water? Why are there not traces remaining, even after several thousand years, of erosion brought on by such a heavy rainfall? Why did God choose such a difficult method by which to destroy mankind, when all he needed was to invent a deadly virus (something perhaps man himself will soon learn to do) to wipe him out?

ROBERT W. BREHME
Wake Forest University
Winston-Salem, North Carolina

4/83

List of refusniks

One may wonder if the space in a professional journal like PHYSICS TODAY is well spent debating such polemical matters as whether a Jew can be a Russian (See letters of Mark Azbel, Ernest Silver, Vladislav Bevc in February, pages 97–101) and whether Academician Anatoly A. Logunov did his best to favor the exit of Victor Brailovsky.

The professional treatment of physicists throughout the world is, however, a clear matter of concern to PHYSICS TODAY and its audience—I therefore believe that it might be of interest to publish a biennial list (more frequent if necessary) of the names of *all* physicists from *all* countries who have been refused attendance at international meetings to which they have been

WONDERING

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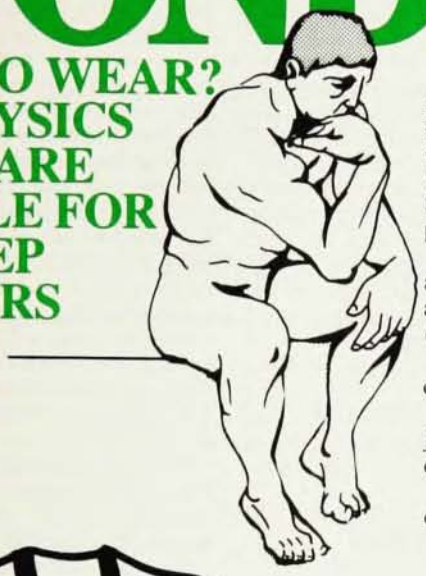

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invited—a refusal which may come either from the country of origin of the physicists or from the host country.

Such a list might be made reasonably complete by asking all physicists from all countries to contribute any instances that come to their attention. Physicists who felt that they had been injustly included might always write a letter to ask for redress. This approach would leave little room for polemics.

HENRY BLUMENFELD
3/83 *Gif-sur-Yvette, France*

Nuclear arsenals

The article "The Nuclear Arsenals of the US and USSR" by Barbara Levi in March (page 43) claimed the Soviet SS-20 has a CEP on the order of 400 m. A source was referenced for the data. I find two problems with this number: First, the International Defense Review 8 (1979), page 1308, reports a CEP of 100 m or less for the SS-20; second, if the SS-20 had a CEP of 400 m there would be no incentive to build the Pershing II, because the Pershing 1A has a CEP on the order of 400 m. Thus the only advantage the SS-20 would have is the MIRV warheads and some range, if indeed this is an advantage. I believe a deeper study will reveal that the great incentive to develop the Pershing II came about because the SS-20 has a CEP of 100 m.

The March issue, while not enjoyable to read, was very informative and contains basic knowledge that most who want to be informed should know.

ROBERT I. HILDEBRAND
US Army Tank Automotive Command
3/83 *Warren, Michigan*

THE AUTHOR REPLIES: The unclassified literature contains a range of estimates for the characteristics of Soviet and American nuclear weapons. For consistency throughout my article, I chose to cite estimates from one widely respected source—The Military Balance 1981–82, published by the International Institute for Strategic Studies.

Even if the SS-20 were known definitively to have a CEP of 100 meters, I would not agree with Robert Hildebrand as to the incentive to develop the Pershing II missile. The increased range of the Pershing II is surely at least as important as its greater accuracy. The capability of this missile to reach targets within the USSR has both political and military impact.

BARBARA G. LEVI
4/83 *Contributing Editor*

Graduate-school announcements

Because of the ever-more-outlandish size and shape of graduate-school announcements, I fear we must include departmental bulletin boards in Garrett Hardin's "Tragedy of the Commons." The ridiculous extent that most institutions have gone to now makes it impossible for any one school's poster to be recognized or found for later reference on a bulletin board.

We have recently established a policy of tossing any announcements we get that exceed the standard $8\frac{1}{2}'' \times 11''$ format into a cardbroad box in the SPS room; they never get to the bulletin boards. By being just a little creative (staple five sheets together) I'm sure graduate schools can figure our how to catch a student's eye and still not use half a bulletin board. Anyday now I expect to get one that will have a request to be plugged in as well as posted.

WILLIAM HESSE
Randolph-Macon College
4/83 *Ashland, Virginia*

Classical orbits in QM?

I am interested in obtaining information or references pertinent to the construction of classical orbits within the context of quantum mechanics. In particular, the use of wave packets for the hydrogen-atom system to represent an orbit in the sense of celestial mechanics (semimajor axis, eccentricity, inclination, and so on) is of especial concern to me. If a reader could direct me to the appropriate references for such computations, I would very much appreciate it.

LAURENCE G. TAFF
Lincoln Laboratory
4/83 *Lexington, Massachusetts 02173*

Public image

Soon after my arrival at the APS meeting in Los Angeles, a lady in one of the local shops asked if I was with the convention. When I said yes, she asked, "are you all physical therapists or what?" If the purpose of the name of the society is to reflect the nature of its membership to outsiders, then this is one more point against remaining "physical."

BRYAN H. SUITS
University of Pennsylvania
4/83 *Philadelphia, Pennsylvania*

Scientists in defense work

The community of physicists has questioned whether serious scientists should get involved with the defense and military establishment of the US. Many have answered in the negative and dissociated themselves from anything to do with weapons or war. We would like to argue that this is wrong.

We start with two premises on which there is general agreement, we hope. First, society as we know it, maybe humankind as a whole, is in grave danger today because of the possibility of nuclear war. Second, some policies will avert the danger while others could result in mutual destruction. The task of finding the ways that may prevent disaster is not at all simple; it is filled with uncertainty, with technical and political controversy.

Many defense policies are based on the development of new technology by the government and its use for military applications. Recent examples are some proposed defense systems whose feasibility, desirability, price and implications are controversial. But decisions on these and other programs (and the allocation of budgets) *will be made* and we will *all* have to live with their long-range consequences whether or not we participate in them. It should be obvious that we need the best scientific talent to take part in the evaluation and decision making. This in turn requires that scientists actively seek participation, use an appreciable fraction of their time to become thoroughly familiar with the technical, strategic, and political aspects of some particular program and then use their knowledge, insight, integrity, broad outlook, and influence to help make wise decisions. We do *not* expect total commitment in the style of the Manhattan Project, nor brilliant ideas that save the world. Rather we hope to see informed debate on the subjects of national defense (and maybe some consensus) as opposed to the emotional "four-legs-good, two-legs-bad" arguments that have dominated public discussion.

Such a commitment from the scientific community would not, we believe, compromise its integrity and objectivity. If some of our best scientific talent stands aloof from the hard and "dirty" questions, lesser minds will rush in and preempt the making of policy. We believe that everybody who has the ability has a moral obligation to help minimize the dangers to all of us.

ABRAHAM SZÖKE
Fremont, California
ABRAHAM GOLDBERG
5/83 *Livermore, California*

Schramm's grad student

I'm writing to say I enjoyed (April, page 27) David Schramm's whimsy—I hope *before* somebody complains that his grad student is female.

BETSY ANCKER-JOHNSON
General Motors Corporation
4/83 *Warren, Michigan* □