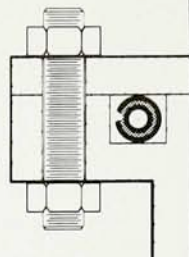


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letters

that would allow the shot axis to remain vertical with base down on landing, thus protecting the fuse in the nose.

He was quickly so successful that we clamored for a similar facility and soon got one near Avebury in Wiltshire. It was quite an experience, and one that Tuve must also have had, to stand near a 4.5" AA gun on a vertical mounting when it was fired and then wait the 125 seconds for the howl of the returning shell and its landing nearby, with a very small but actually non-zero chance of being directly underneath it.

I remember how impressed we were by Tuve's speed in building a team of 150 physicists and engineers to create his true radar proximity fuse. I believe that he took not more than eighteen months from initiation to operation.

The fuse was the memesis of the kamikaze pilots, for whom it was explicitly designed, and turned the course of the war in the Pacific. It was a fantastic achievement.

I never met Tuve again, but I have frequently sung his praises.

JOHN F. ALLEN
University of St. Andrews
St. Andrews, Scotland

11/82

In answer to creationism

Your readers may be interested in the following resolution concerning astronomy and creationism which was recently passed (unanimously) by the Board of Directors of the Astronomical Society of the Pacific.

As scientists and educators, we are concerned that a religious doctrine called "scientific creationism" or "creation science" is being advanced as a scientific alternative to the evolution of the physical and biological world.

Among its many dubious tenets, creationism proposes that the age of the universe is only a few thousand years, an idea that flatly contradicts both the physical evidence that has been accumulating for centuries and its logical interpretation. An examination of that evidence clearly indicates ages for the Earth, the solar system, and the Milky Way galaxy that are vastly older than a few thousand years.

The radioactive dating of materials from the Earth, the Moon, and meteorites shows the age of the solar system to be at least 4.6 billion years. The abundances of heavier elements and the evolution of the great globular clusters of stars show that our galaxy is substantially older. Moreover,

these methods of age determination (while they are the major ones) do not stand alone; there are many other independent strands of evidence that point to similar conclusions. In fact, the vast sizes of astronomical systems virtually demand that we think in terms of millions to billions of years. The light from distant galaxies, for instance, requires more than a billion years just to reach the Earth.

The evidence further indicates that evolutionary change is not merely a biological process, but one that characterizes the entire physical universe. It is clear that large-scale and long-term changes in the cosmos as a whole had to occur to produce the stars, the heavier elements, and ultimately the planetary system in which we live before biological evolution on Earth could even begin. To deny this process of cosmic evolution is to deny centuries of scientific evidence and thought and to turn back to a worldview based in superstition and ignorance.

Creationism is not a science, but rather an expression of the religious beliefs of a small minority. As such, it has no place in museums, science classes, or science text books.

It is, perhaps, a sad comment on our times that such a resolution is even necessary. Still, it seemed that those of us in the physical sciences have a great deal to contribute to public education in this area and that we should not let the full burden of answering creationist claims fall on our colleagues in the biological sciences.

ANDREW FRANKNOI
Executive Officer

The Astronomical Society of the Pacific
11/82 San Francisco, California

Pan-American collaboration

In a recent guest comment (August, page 9), Leon Lederman expressed views about Latin America-US scientific cooperation that call for some clarifications.

Lederman's comment is paternalistic from the beginning to the end. A true scientific cooperation can exist only on an equal basis; a Latin American scientist should not be perceived differently than a European or any other scientist. In a scientific collaboration, both parties benefit from complementary expertises. Hundreds of examples already exist of cooperation between US and Latin American scientists working on an equal basis in several fields of physics (including high-energy theory). It is clear that this situation does not

exist in experimental high-energy physics because of the poor development of this area in Latin America. Therefore, what Lederman is talking about should be called training or something else that will carry benefits, other than scientific, for the trainer. Lederman explicitly indicates as a benefit the future use of American technology by the trainees once they are back in their own countries. This idea sounds like the counterpart to the Russian scholarships for third world countries that always carry, as an "extra bonus," extensive training in Marxism.

However, the most worrisome point is that this project might produce an extremely negative change in the profile of the experimental physics in Latin America. In these countries human resources are very limited and the demand for education has grown explosively for other disciplines. The number of students in physics has been constant and even decreased. An area of physics cannot be overdeveloped without depleting other disciplines. A high-energy project of the size and scope proposed will take at least one third of the young people away from other areas of research, charmed by the possibility of doing research in a big laboratory that will never exist in their own country. For developing countries, a strong science is of prime importance. The technological dependence that kills their economy cannot be overcome without a wide scientific development. No one doubts that high-energy experimental physics should be developed in Latin America. However, areas such as semiconductor physics, materials science, optics, surface physics, and so on are at least as important and might eventually have a wider and more important impact on the social development of these countries. A proper balance should not be lost.

In the already troubled relations between North and South, the worst thing that can be done is to extrapolate models, which are valid for the societies of the North, to the socially and culturally different southern countries. Before starting the organization of the "Experimental Trieste," a much more extended consultation with all the sectors in Latin American physics is required if a true contribution to the improvement of scientific cooperation is to be made. Otherwise a well-intentioned action might turn out to produce irreversible damage to the future impact of physics on Latin American social development.

A minor point that also should be clarified is the claim that the symposium held in Cocoyoc, Mexico, in January 1982 was a unique event in Latin America since it had 50 attendees and ten Latin American countries represented. It is mentioned that the last

assembly of this size took place over ten years ago. Although this statement might be true for high-energy physics, it is inaccurate for other fields. For instance, last October the second Latin American Symposium of Surface Physics was held in Puebla, Mexico. It had about 100 attendees from over 12 countries including Spain and about 26 institutions. These figures were similar to those for the first conference held in Iteroy, Brazil, two years ago. The conference level equaled that of any international conference on the field. The participants decided to hold the third conference in 1984 in Costa Rica. Participation of Spanish-speaking scientists working in the US will be encouraged through the strong relationship with the American Vacuum Society. In the field of solid-state physics, the SLAFES (Latin American Symposium of Solid-State Physics) has been organized over the years in different countries on a regular basis, always in the range of 100 participants. Many other examples can be cited such as the Ibero-American Congress of Catalysis and the Latin American Congress of Electron Microscopy. In most cases, the "soul" of the organization has been the CLAF (Centro Latinoamericana de Física), a multinational organization based in Brazil which has a long and solid tradition of promoting international scientific cooperation in Latin America despite its enormous financial difficulties.

MIGUEL JOSE YACAMAN
West Virginia University

11/82 Morgantown, West Virginia
THE AUTHOR COMMENTS: My dictionary defines "paternalistic" as controlling a group in a manner suggesting a father's relationship to his children. Miguel Yacamán, after making this harsh accusation, goes on to worry about the "extremely negative change" and "irreversible damage" our efforts may produce. It seems to me that Yacamán knows exactly what Latin American scientists ought to do—he suggests that they develop semiconductor physics, materials science, and so on and "not lose a proper balance." Just who is being paternalistic? We, at Fermilab, have simply offered Latin American scientists an option. We would be delighted to be hosts to visitors and to offer our facilities to their competent scientists. They are free to accept this offer or to refuse it. Experimental physics at Fermilab is no rose garden—it is often an eighteen-hour day and a seven-day week. Our climate can hardly be a great temptation to a resident of Rio or Bogotá! However, as part of the world community of scientists, Latin Americans have a right to help exploit the facilities we are fortunate enough to have been able to construct. Is it not pater-