letters

APS is to promote the health and unity of physics. In this respect, instead of big science versus small science, let's have imaginative science, imaginative industrial collaboration—and imaginative financing, of course.

D. WALSH
McGill University
4/85 *Montreal, Canada*

Quasar redshifts

In your Search and Discovery story about quasar redshifts (December 1984, page 17) you write, referring to quasar luminosities, "We have as yet no satisfactory theory to explain this prodigious phenomenon." In fact, according to the chronometric theory,[1] large-redshift quasars have about the same luminosity as the Milky Way, although according to the Doppler theory of the redshift they are about 50 000 times as bright. The chronometric redshift theory is nonparametric (no q_0 or Λ as in the Doppler theory) and nonevolutionary (evolution being effectively an unlimited number of parameters introduced in the Doppler theory for the description of large-redshift objects to reconcile quasar observations with theory). If there is anything scientifically unsatisfactory about it, it has yet to be established.

Nevertheless, quasars appear as the best probes of the large-scale universe—not because of extraordinary luminosity, but because they provide "standard candles" within the framework of the chronometric cosmology as shown by an analysis[2] of the largest available sample of quasars due[3] to Maarten Schmidt and Richard Green.

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I. E. SEGAL
Massachusetts Institute of Technology
12/84 *Cambridge, Massachusetts*

Tokamak applications

Harold Furth's article, "Reaching ignition in the tokamak" (March, page 52), included an excellent photograph of the innards of the Princeton machine, highlighting the movable limiter and its protective tiles. It would have been appropriate to mention that this hardware was designed and built by GA Technologies and that the special coatings for the graphite tiles were also developed there. It may well be that these materials and coating will play an important role in hardening missiles against all types of laser threats. This is just one of many spinoffs from the fusion program that will have an application to future defense programs.

HAROLD M. AGNEW
5/85 *San Diego, California*

Einstein and the Vatican

The year 1979 was the centenary of Albert Einstein's birth. Several international commemorative meetings were held during that year, among which the most remarkable was the gathering arranged by the Pontifical Academy of Sciences at the Vatican.

Four individuals addressed[1] that meeting in Rome. Carlos Chagas, the president of Pontifical Academy and a distinguished biophysicist, reviewed[2] Einstein's life. P. A. M. Dirac analyzed Einstein's achievements in relativity and quantum mechanics. Victor Weisskopf described the influence of Einstein's insights on theoretical and philosophical developments. Any one of these three talks would have fitted smoothly into the proceedings of the other, purely scientific, Einstein commemorative celebrations held away from Rome.

On the other hand, the speech at the meeting at the Vatican given by Pope John Paul II was unique and most remarkable. After some preliminary discourse on the interactions of science and religion, he turned to "the case of Galileo." The trial and condemnation of Galileo is well known in a superficial form to the public in general, for the subject has attracted the attention of playwrights and dramatists since early in this century. In preceding centuries the subject has also been used as a stick to beat the Catholic Church. In recent decades, however, even a few Catholic scholars have recognized openly[3] that the Church made a mistake in condemning Galileo. The second Vatican Council took[1] a small step in that direction when it stated "we cannot but deplore . . . certain attitudes found, too, among Christians insufficiently informed of the legitimate autonomy of science. Sources of tensions and conflicts, they have led many minds to think that science and faith were opposed." By coupling this text to a note with a reference to Galileo, the Council obliquely hinted that some impropriety may have occurred in the treatment of Galileo.

However, it required a Pope with the character of Karol Wojtyla to say,[1] on the occasion of the Einstein centenary:

> [Galileo] had to suffer much—we cannot deny it—from men and organizations within the Church . . . I hope that theolo-

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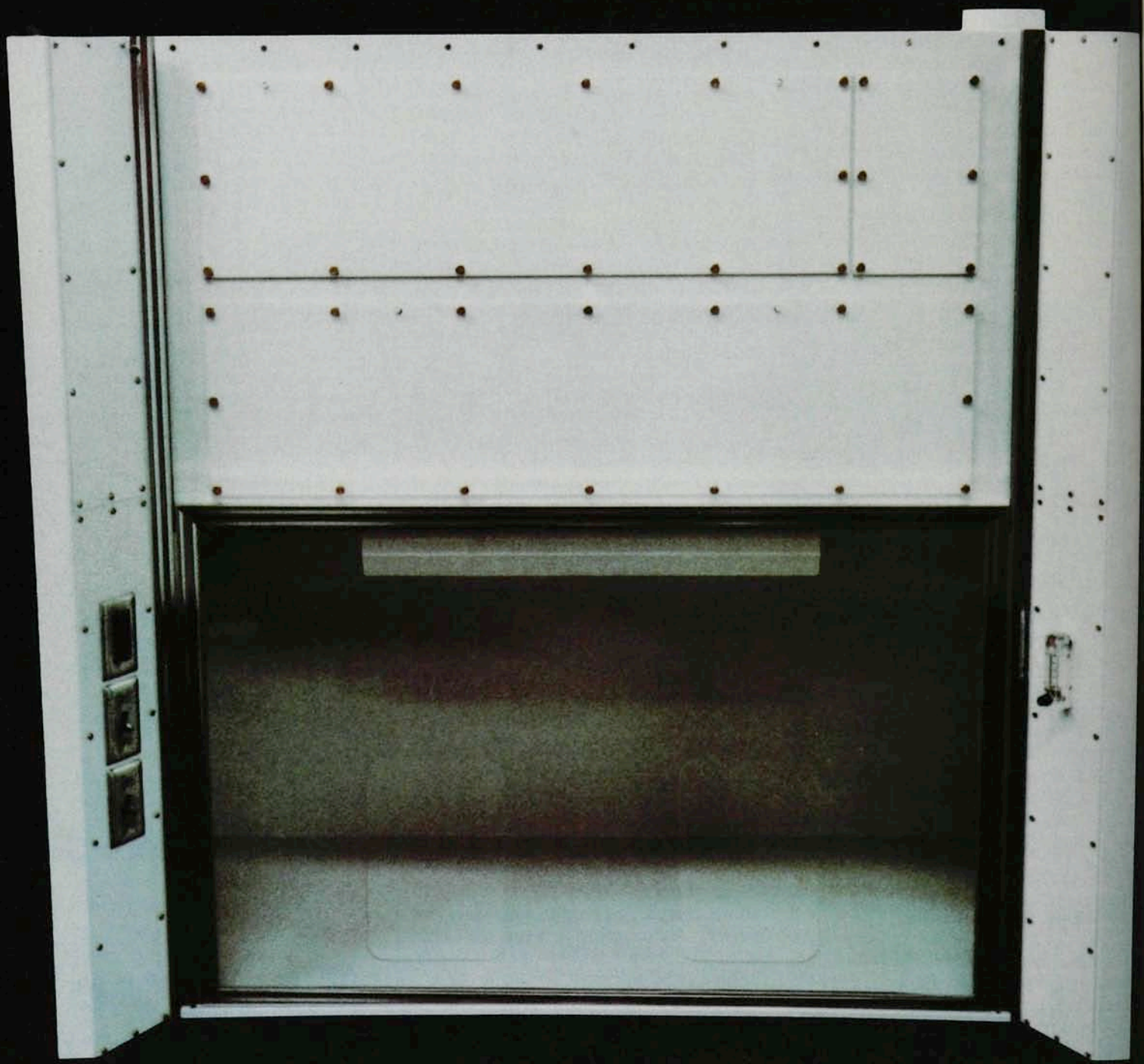

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gians . . . will more deeply examine Galileo's case, and by recognizing the wrongs . . . will dispel the mistrust that this affair still raises in many minds . . . I will give all my support to this task, which will honor the truth of faith and of science.

Pope John Paul II coupled the names of Galileo and Einstein, contrasting the honor bestowed on the latter with the abuse heaped on the former. But such a contrast obscures the attitude of the Church toward Einstein[4] before 1979.

Church trials and condemnations of scientists were out of style in the early part of the 20th century, but there were more subtle ways of expressing displeasure. At least some predecessors of John Paul II did not seem inclined to accord honors to Einstein.

Although it had existed in principle for several centuries, the Pontifical Academy of Sciences was rejuvenated[5,6] and set on its modern course only about 50 years ago, in 1936. In that year, Pope Pius XI appointed[2] approximately 80 individuals to the Academy. In addition to about ten members of the Vatican hierarchy itself (including Cardinal Pacelli, who became Pius XII) and a large number of Italian academicians whose names are not widely remembered today, he appointed world-class stars of the world of physics at that time: Max Planck, Ernest Rutherford, Niels Bohr, Erwin Schrödinger, Robert Millikan, Pieter J. W. Debye.

There is one glaring absence from this list—Einstein—the preeminent physicist of the century. Why was his name missing? We can only guess. Nevertheless, published records and documented historical information point[5,6] to reasonable inferences.

In 1933, Pope Pius XI had signed a concordat with Nazi Germany. It would not have been politic at that time to irritate the Nazis by honoring the man they had decreed was an enemy of the Third Reich. After Carl von Ossietzky, the famous German antiwar activist, was awarded the Nobel Peace Prize in 1936, not only was he not permitted to accept it, but shortly thereafter Hitler decreed that all subsequent laureate designates were to decline the award. As is more evident in other historical matters, the policy of not irritating the Nazis was a feature of the reign of Pius XII as well—who, incidentally, was Secretary of State for Pius XI.

One can discern another motive interlinked with the immediate political one, but probably of more ancient standing. Einstein had openly asserted his Jewish identity long before the Nazi takeover. Among other very famous scientists on the original 1936 Pontifical Academy list (in addition to those already named) are physicists Pieter Zeeman, Willem H. Keesom, Ugo Amaldi, Franco Rasetti and Guglielmo Marconi, mathematicians George Birkhoff and Constantin Caratheodory, biologists Alexis Carrel, Armin Tschermak–Seysenegg, Thomas H. Morgan, Lucien Cuneot, Charles S. Sherrington and Bernardo A. Houssay. Despite the very high incidence of Jewish names among first-class scientists in the first half of this century, especially in physics and mathematics, none appears in the lists of election to the Pontifical Academy.

Only in 1955, still during the reign of Pius XII, do we find one name from the coterie of geniuses expelled by European anti-Semitism: Theodore von Kármán, one of that cluster of brilliant scientists (George von Hevesy, Leo Szilard, Eugene Wigner, Edward Teller, John von Neumann, and so on) who came from intellectual, well-off, Hungarian Jewish families of the late 19th and early 20th century, but whose name as such does not disclose his origins. Also in 1955, the names of Nobelists Louis De Broglie, Max von Laue, Otto Hahn and Werner Heisenberg were added to the rolls of the Academy. But still we do not find Einstein, although he was alive on the date of election of these distinguished physicists.

A clear change in attitude becomes evident after 1972, when Carlos Chagas was appointed President of the Academy, during the reign of Pope Paul VI. A truly ecumenical scientific gesture was the appointment to the Academy in 1975 of Michael Sela, the distinguished Israeli biochemist who is President of the Weizmann Institute. From 1974 on, and particularly among the large groups of appointments in 1978 and 1981, one recognizes the names of a number of Jewish scientists. Thus was the stage set so that 25 years after his death Einstein was welcomed into the Pontifical Academy of Sciences. Galileo had to wait over three hundred years.

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IRVING M. KLOTZ
Northwestern University
Evanston, Illinois

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Peer review

Let's not assume as an axiom that "peer review" is a system totally beyond question. I don't know of anyone who has never received a stupid, incompetent "peer" review. The idea of peer review is good; in practice, however, we sometimes get arrogant reviews, malicious reviews, hostile reviews, incompetent reviews and reviews by people who haven't even read through the proposed work.

There is a reason to be concerned about the morale of scientists whose well-thought-out projects are denied funding. What nonsense it is to maintain that the peer-review system is always an impartial adjudicator of scientific merit. Are reviewers indeed impartial? Generally they are people who feel competitive, at the very least. So some university bypassed the process. Big deal. They had to convince people, too, and I haven't seen much evidence that scientists as a whole are less prejudiced and more able to judge usefulness of other people's work than Congressmen; nor is there evidence that reviewers are necessarily experts on the proposed work—particularly if it is new and original or even possibly a breakthrough. In fact, in the latter case the reviewer will generally be hostile. Look at George Green, Oliver Heaviside, Joseph Fourier, or a thousand others.

Peer review should require that reviewers be selected from a group of candidates who are competent in the author's area. Peer review should allow answers to irrelevant questions or statements such as "I don't see how this could work" before a final decision is made. If the goal is to provide efficient allocation of resources for the good of the country, a better system is needed, not blind support. Richard Bellman, a member of both the National Academy of Sciences and the National Academy of Engineering and a winner of numerous awards, had a file drawer of incompetent reviews with which he had intended to paper his study, but then didn't bother.

When I give my time to carefully review a proposal (without compensation), I'm sometimes upset more by some of the work I see funded than by the very few that may have missed review, although that too is undesirable.

I suppose I'll get a scathing response from a well-funded reviewer, entrenched with friends in an agency, who can happily continue his decades-old work and deny funding with a five-minute glance at a proposal he has not understood. However, if the reviewers are so smart, why do they hide behind complete anonymity? Is scientific truth a matter of opinion? Shouldn't scientists be able to agree with discussion? If not, the system doesn't matter, and it might as well be political and avoid pretense of solemn, scientific, impartial judgment.

G. ADOMIAN
12/84 *Athens, Georgia*

Nuclear winter

In February 1984, PHYSICS TODAY published a Search and Discovery story (page 17) summarizing the studies of nuclear winter as conducted by several groups. Since then I have not seen further comment in PHYSICS TODAY; but from the Pentagon there is a report that a panel of scientists have confirmed the findings.

A matter of such importance is an area in which angels fear to tread, and I voice my misgivings with the greatest hestitation. However, they are:

▶ In general, man's efforts are puny compared with Nature's. In 1883, Krakatau exploded with great violence, and the dust thrown up into the stratosphere colored sunsets for months. What the experts are saying is that, in terms of stratospheric dust, Krakatau is dwarfed by gigaton nuclear explosions.

▶ This argument may be dismissed as too vague, although I for one find it disturbing. The chief point is that there is an experimental observable, namely, colored sunsets. In 1945 two cities were destroyed by 20-kiloton nuclear bombs. Now, the 100-megaton bomb, referred to in the article of a year ago, represented the effects of one thousand 100-kt bombs on individual cities; the effects of single bombs are therefore presumably additive. Thus in 1945 we should have seen a dust burden of, say, 10^{-3} of that of the nuclear winter. But I for one recollect nothing at all in the way of colored sunsets. I submit that the discrepancy between no visible effects and total blackout for a month must represent a difference of considerably more than three orders of magnitude. I submit also that in the 1953–68 period of above-ground nuclear testing, there must have been an occasional month when the total megatonnage exploded must have been 100; and the same argument applies.

If you can lighten my nonnuclear darkness on this discrepancy, I shall be grateful.

W. D. ALLEN
1/85 *Oxon, UK*

THE AUTHOR COMMENTS: W. D. Allen notes some apparent conflicts between the nuclear winter predictions and historical experiences with volcanoes