

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.

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## 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,<sup>1</sup> 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  $\Lambda$  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<sup>2</sup> of the largest available sample of quasars due<sup>3</sup> to Maarten Schmidt and Richard Green.

## References

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2. J. F. Nicoll, I. E. Segal, *Astron. Astrophys.* **144**, L23 (1985).
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## 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.

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## 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<sup>1</sup> that meeting in Rome. Carlos Chagas, the president of Pontifical Academy and a distinguished biophysicist, reviewed<sup>2</sup> 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<sup>3</sup> that the Church made a mistake in condemning Galileo. The second Vatican Council took<sup>1</sup> 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,<sup>1</sup> 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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