SCIENCE

5 September 1975

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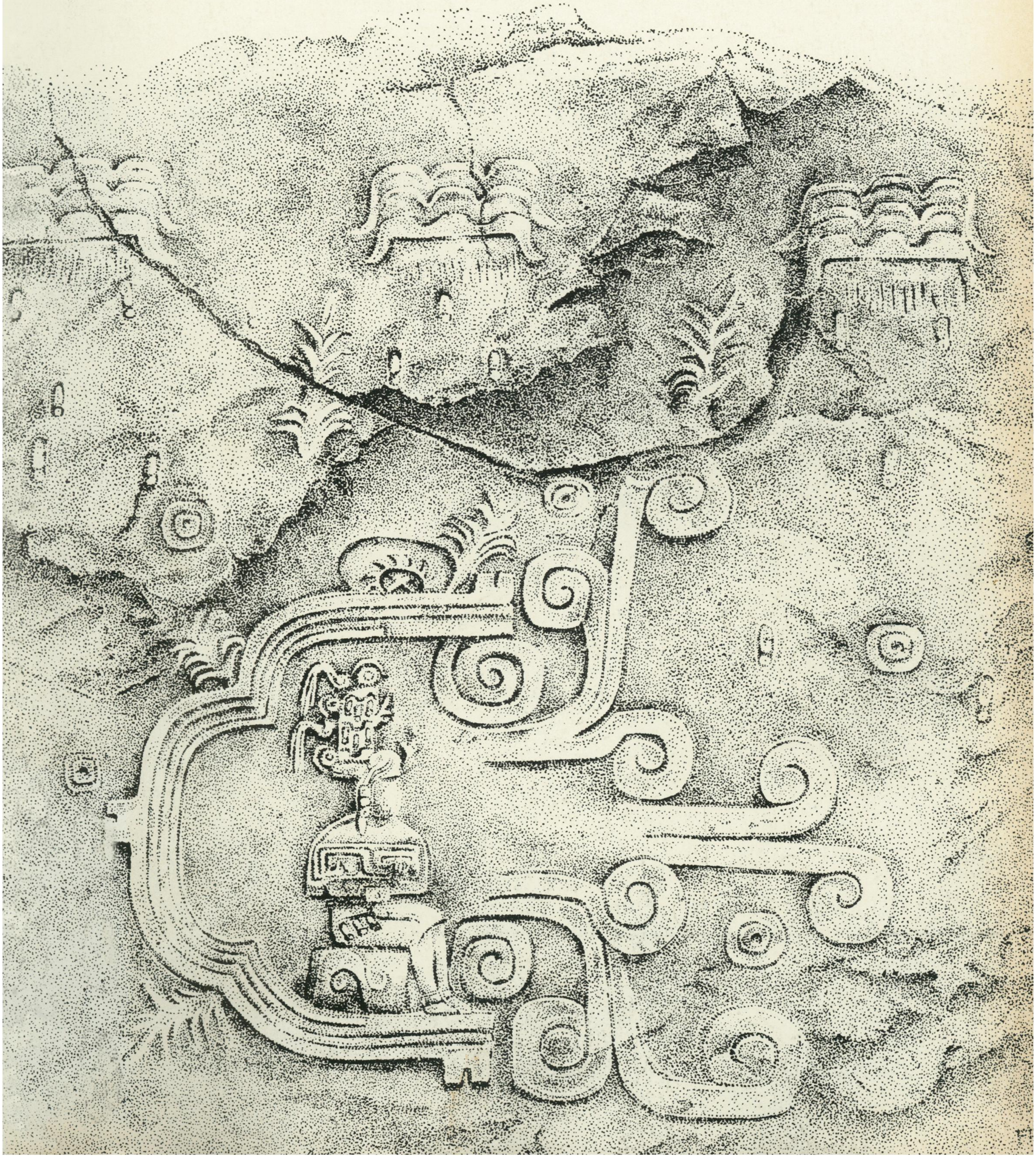
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



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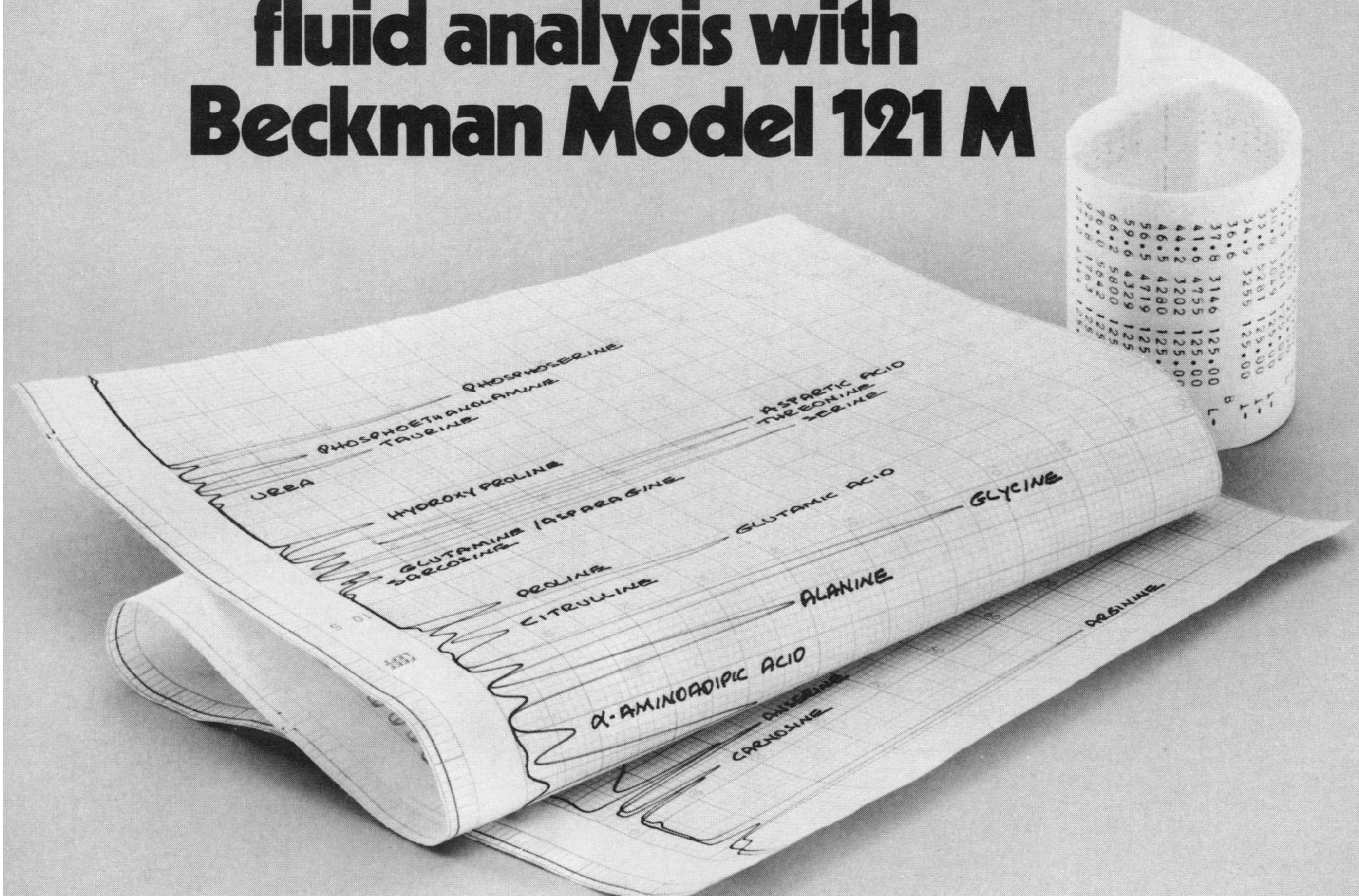

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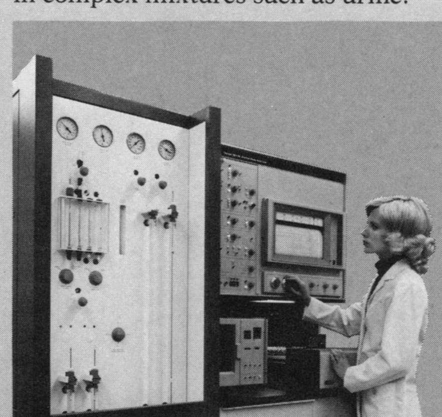

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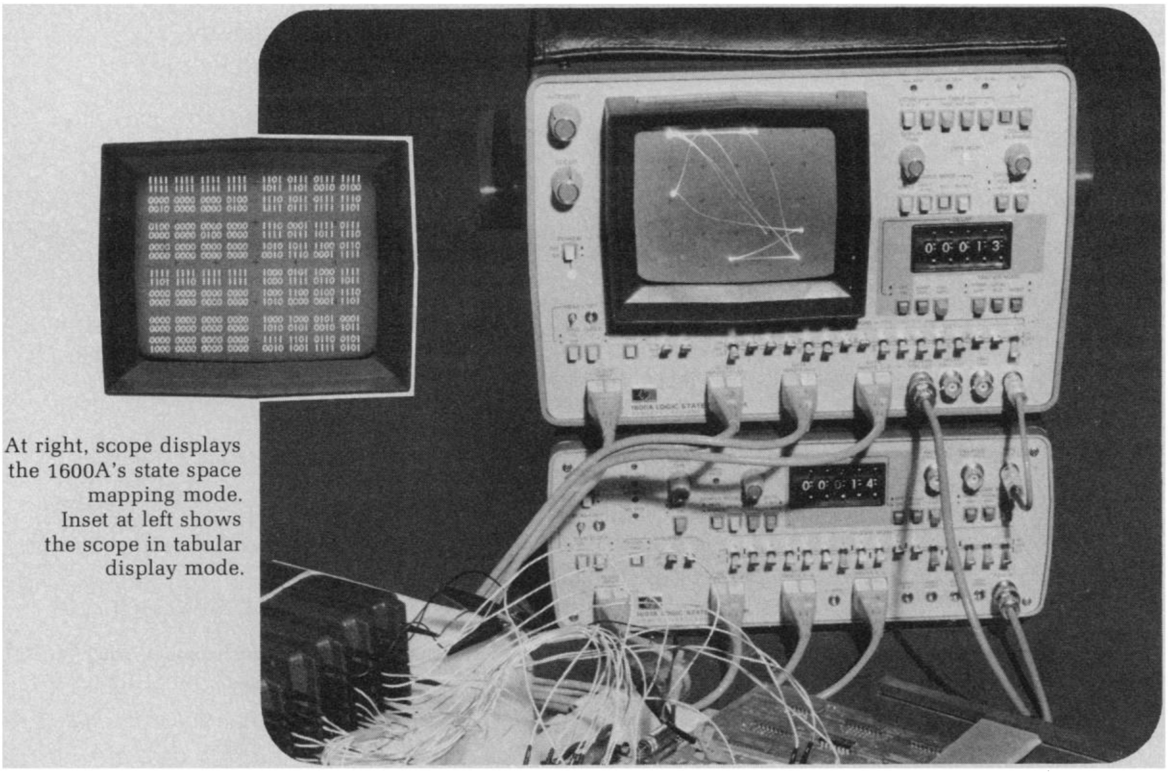
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

COVER

Relief I, Early Formative Olmec site of Chalcacingo, Morelos, Mexico. This bas-relief carving (2.75 millimeters in height) depicts an Olmec personage with elaborate headdress and ceremonial bar seated in a U-shaped niche or cave from which scroll-volutes of mist are issuing. The niche becomes an Underworld Earth-Monster mouth with stylized eye above and fang-motifs at the opening. This design, with three rain clouds above, raindrops, and maize symbols, implies an Olmec cosmological theme of the Underworld and agricultural fertility. See page 753. [Drawing by Frances Pratt from *Chalcacingo* by Carlo T. E. Gay; courtesy of Akademische Druck-und Verlagsanstalt, Graz, Austria]

MEASUREMENT *hp* COMPUTATION advances from Hewlett-Packard



At right, scope displays the 1600A's state space mapping mode. Inset at left shows the scope in tabular display mode.

Simplify troubleshooting in the data domain.

Two new Hewlett-Packard logic state analyzers, triggered and indexed on digital words, prove a real boon to those who debug, test, and troubleshoot digital systems.

When a digital system malfunctions, one of the troubleshooter's first tasks is to determine on which data word the breakdown occurred. Unless he can monitor the parallel data streams—bit by bit and word for word, the same way the system components see them—all the time and frequency domain test instruments in the world will do him little good.

To help him operate efficiently in the data domain, HP has introduced two new logic state analyzers—Models 1600A and 1607A—that can capture the flow of digital data in 16 or 32 parallel channels, at clock speeds up to 20 MHz. Both instruments permit display of the data in easy-to-read word format, as a succession of 1's and 0's on a CRT screen.

To the digital system troubleshooter, the most important contribution of these logic state analyzers is that they allow him a full choice of data analysis techniques to meet the requirements of the task at hand. With pushbutton ease, he can quickly accomplish any of the following:

- Page through a system 16 words at a time at machine speed, to trace data flow.
- Automatically trigger on a fault, capturing events before and after the "crash," to help him find the cause.
- Capture a 16-word window any desired number of clock pulses from a trigger word, to follow branching operations.
- Automatically identify inactive data lines, to find program errors.
- Store a sequence of 16-bit words and display an active table side by side, for quick comparison.
- Automatically halt and store active data when it does not match a stored table—a great help when trying to find intermittent malfunctions.
- Using a special "mapping" technique, display all *active* combinations of the 16 parallel input lines on a map pattern of 2^{16} dots, each of which represents one of the possible combinations—and thus quickly identify the activity of a system in a repetitive loop *without having to read a tabular listing*. If an anomaly occurs in the mapping mode, it is presented in its most conspicuous form.

The 1600A has a built-in display and costs $4000*. The 1607A costs $2750* and provides an analog output for use with a separate, conventional scope, converting that scope to a logic state analyzer. It also has digital outputs that are used to expand the 1600A to 32-bit or dual-clock capability.

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Women and Minority Scientists

The participation in science of women and members of minority groups is shockingly small, and the proportion of both groups drops at each higher level of degree, salary, academic rank, and administrative responsibility. A new report* which brings together virtually all available data on manpower trained and in training at professional levels shows that among almost 207,500 science and engineering Ph.D.'s in the U.S. labor force, 93.4 percent are white and 92.1 percent are male. Only 0.8 percent are black, 0.6 percent Latin, and 0.04 percent American Indian, while Orientals, who make up only 0.7 percent of the U.S. population, comprise 5 percent of science and engineering Ph.D.'s.

The proportion of women enrolled and graduating in these fields was higher in the 1920's than in any decade since, but is now rising faster than their opportunities for the jobs in industry, government, and academe that lead to responsible participation in the scientific work force.

In chemistry, for example, women have earned 19 percent of the bachelor's degrees, 20.8 percent of the master's, and 7.3 percent of the doctorates since 1960, and they earned 9.7 percent of the chemistry doctorates in 1973. However, at institutions awarding the doctorate in 1973 only 2.0 percent of the chemistry faculty above the level of instructor were women, and only 14.8 percent of federally employed chemists at all degree levels were women.

Blacks comprised only 1.2 percent of the 1973 doctoral chemists—a proportion higher than in other fields of physical science, but slightly below their 2.4 percent representation in the life sciences. The number of non-Oriental minority scientists and engineers remains so small that there is little statistical evidence of discriminatory hiring or promotion practices.

Blacks and women were about equally represented at 1.8 percent each among those who received bachelor's degrees in engineering in 1974. The Spanish surnamed rose to 2.5 percent of the class, while American Indians were still less than 0.1 percent. These graduates were easily placed.

In mathematics women earned 32 percent of the master's, and 10 percent of the doctorates in 1973, but only 6.7 percent of the full-time mathematical scientists at 20 leading universities in January 1974 were women. In the biological sciences, where women earned 30 percent of the bachelor's degrees, 30.5 percent of the master's, and 21.5 percent of the doctorates in 1973, only about 12 percent of employed Ph.D.'s that year were women.

The proportion of women Ph.D.'s in the social sciences was 17 percent in the 1920's, dropped to 11 percent in the 1950's, and rose to 15 percent in the 1970's, ranging from 6 percent in economics to almost 30 percent in anthropology. The unemployment rate is four times higher for women than for men with comparable training.

In medicine, where the proportion of women is increasing faster than in most other fields of science, women comprised 11.1 percent of the 1974 graduating class but 18 percent of the total enrollment and 22.2 percent of the first-year enrollment. However, only 7 percent of practicing physicians are women, and they are concentrated in the less prestigious, less well paid specialties.

While this and other recent studies show some improvement in the participation and utilization of women and minorities in science, the position of new women Ph.D.'s in a falling employment market has deteriorated over the past 5 years. Unemployment rates for women continue to be two to four times higher than for men with comparable education and experience.

It seems apparent that if women and members of minority groups are to be encouraged to prepare themselves for careers in the sciences, the scientific community as well as the employers of scientists in all sectors must offer them the same opportunity as white men to find suitable employment, to advance according to their abilities, and to be paid commensurately for their services.

—BETTY M. VETTER, *Executive Director, Scientific Manpower Commission*

**Professional Women and Minorities—A Manpower Data Resource Service* (Scientific Manpower Commission, 1776 Massachusetts Avenue NW, Washington, D.C. 20036).

THE ANSWERS ARE OUT THERE.

1. What physical processes enable quasars to generate power up to that of 50 trillion suns?

2. Do planetary systems exist around other stars?

3. How does Hubble's Law for recession of galaxies depart from linearity at large red shifts?

4. What extreme ultraviolet spectral features are characteristic of quasars with very large red shifts?

5. What is the small scale structure of the giant red spot vortex on Jupiter and how does it vary with time?

6. Ad infinitum.

borne and his associates showed that the track structure in the emulsion was consistent with the monopole explanation, but not with the superheavy nucleus.

While this evidence appears convincing, researchers will remain skeptical until more data and hopefully more monopoles are available. For example, implausible though it may seem, an electrically charged particle with a Z of about 70 and a mass of 10,000 protons could also have caused the observed track. Some physicists, including Owen Chamberlain of the University of California's Lawrence Berkeley Laboratory who has had a chance to examine the experimental results, believe that there is a small but nonnegligible chance that a less massive charged particle could have caused the observed detector response. If the particle suffered one or more collisions that caused it to lose some of its charge as it passed through the Lexan, the damage would approximate the uniform damage expected for a monopole.

Other scientists, such as Luis Alvarez of the Lawrence Berkeley Laboratory who was involved in the search for monopoles in the moon rocks, want to know why previous attempts to find monopoles failed. More than one unsuccessful monopole hunter suggested that monopoles with the charge, mass, and velocity reported by Price and his colleagues ought also to have been detected in their experiments. I' is important that this question have a satisfactory answer because the effective collecting power (measured in square meter-years) of the other experiments exceeds that of the balloon experiments by about a factor of 10^5. It is to be noted, however, that this large collecting power is based on the assumption of certain properties of monopoles that have not been verified.

The best answer would be to catch a monopole or at least obtain more monopole tracks. Price, Osborne, and their associates are looking into the possibility of an expanded balloon experiment embodying perhaps 50 balloons with 40 square meter detectors. Antarctica might be a good location for the search, they suggest, because the continuous sunshine in the summer there would enable balloons to be kept aloft for long periods.

Regardless of whether the present report of a magnetic monopole is confirmed by future experiments, it might be wise to recall what Dirac noted in his original paper: since the possibility of the existence of monopoles is not precluded by quantum mechanics, it would be surprising if nature did not make use of this possibility.

—ARTHUR L. ROBINSON

References

1. P. B. Price, E. K. Shirk, W. Z. Osborne, L. S. Pinsky, *Phys. Rev. Lett.*, in press.

LETTERS

(Continued from page 750)

and even with colleagues at MIT to vague hints that an interesting structure had been observed in the electron pair spectrum. Some colleagues interpreted my remarks as important news, others did not. B. Richter (a member of the SLAC experimental team), who was in Cambridge to give the Loeb lectures at Harvard, did not seem particularly impressed by my story—told at a cocktail party at the end of October. I now regret having been so ambiguous in my remarks and I apologize to him and others for not being more explicit.

In any case, it became obvious that the news was spreading through the physics community. On 4 or 5 November, a technician working for a different MIT-LNS group at Fermilab remarked in a telephone call that the Ting group at Brookhaven was preparing a champagne party to celebrate their discovery of a new particle. I repeatedly urged members of the Ting group to end this state of "secret publication." The first news of the beautiful SPEAR experiments reached me on 10 November, when D. Frisch relayed the gist of a telephone call he had received from SLAC, and I, in turn, alerted Ting, who was on his way there.

MARTIN DEUTSCH
*Laboratory for Nuclear Science,
Massachusetts Institute of Technology,
Cambridge 02139*

Island Sanctuary

The system of primary wildlife reserves which A. L. Sullivan and M. L. Shaffer examine in their article (4 July, p. 13) is an essential system for the ensuring of a diversity of plant and animal species in the future. They rightly point out the need for a hierarchy in developing such reserves.

I should like to offer a reserve, an established sanctuary, a coral atoll in the South Pacific which is already dedicated to scientific research. This atoll is 5 kilometers in diameter, 700 meters from outer reef to lagoon, and 5 meters above sea level. Two hundred years ago it served as the center of a Polynesian kingdom.

For those who wish to work in an island biogeography environment, the sanctuary provides a unique opportunity. Scientists interested in working on the atoll are cordially invited to respond. No grants are available, but the committee will help in other ways and housing will be provided.

LAWRENCE L. BARRELL
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