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LETTERS

Obscurity cult

I have often marveled at the problem that is the basic query of your [April] editorial ("Is physics too tough?"). It has seemed to me for some years that among physicists there is almost a cult, although certainly not an organized one, which I please to call a cult of obscurity. The creed of the cult is that a member disgraces the profession if he ever writes, lectures or teaches intelligibly to anyone but his immediate colleagues in the profession.

Some high-school physics teachers are true soul-members of the cult, but most are not. The nonmembers, however, often feel driven to make physics difficult in order to live up to standards that they believe are actually and validly set by members of the profession.

The cult varies in strength from decade to decade but would appear to be near a maximum just now. Noncommunicants cannot help but feel the lash of scorn from cultist colleagues. I suggest that the present ascendancy of the cult is the major force making "physics too tough."

Robert N. Varney
Lockheed Missiles & Space Co.

Discovery of the electron

Those who believe J. J. Thomson discovered the electron (letter by W. B. Lewis, PHYSICS TODAY, May, page 12) should read A. Schuster, *Proc. Roy. Soc.* **47**, 526 (1890); E. Wiechert, *Sitzungsber. der physikal.-ökon. Ges. Königsberg* **38**, 1 (1897) and *Wied. Ann., Beiblätter*, **21**, 443 (1897); and W. Kaufmann, *Wied. Ann.* **61**, 544 (1897) and **62**, 598 (1897). Schuster, Wiechert and Kaufmann determined the ratio of e/m for cathode rays, which is precisely what Thomson did, and in so doing they assumed the particle nature of the electron.

Schuster's value for e/m was poor, but Wiechert found it to be between 2×10^7 and 4×10^7 emu, and Kaufmann obtained first 10^7 and then 1.77×10^7. These values are quite as good as Thomson's values of 7.7×10^6 and 1.17×10^7 as given in *Phil. Mag.* **44**, 293 (1897). Indeed, later measurements of e/m (1.758796×10^7) are extremely close to Kaufmann's value of 1.77×10^7.

Paul T. Bailey
Massachusetts Institute of Technology

Exploration by computer?

It is often stated that distant stars cannot be investigated by earth people because it would be impossible to build a rocket capable of traveling more than 5% of the velocity of light. Therefore, the argument goes, the exploration would take more than 100 years and could not be accomplished either because people would be incapable of enduring such long isolation or because the rocket would have to be too large (too expensive, too). These points were discussed by Herbert Malamud in reviewing *Flight to the Stars* by James Strong (PHYSICS TODAY, April, page 95).

Why are we so preoccupied with sending human beings to explore the stars? Instead we could send instrument packages. Thus the size of the rockets could be reduced, and, if we have faith in our future (after all, we bury time capsules after world's fairs) the time required for interstellar exploration should be of no concern.

For the first several missions we might make the packages return to earth with their findings. In the future we could send miniature robots to occupy planets of distant stars and set up communication links with the earth using energy from sources on the planets.

Certainly we expect that a computer capable of human intelligence will be

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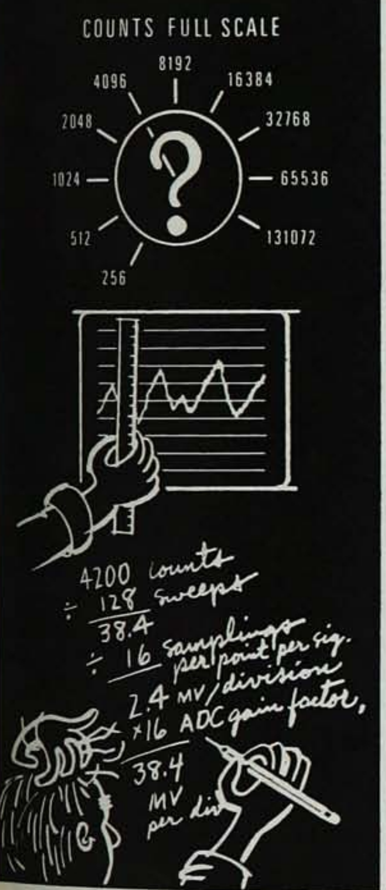
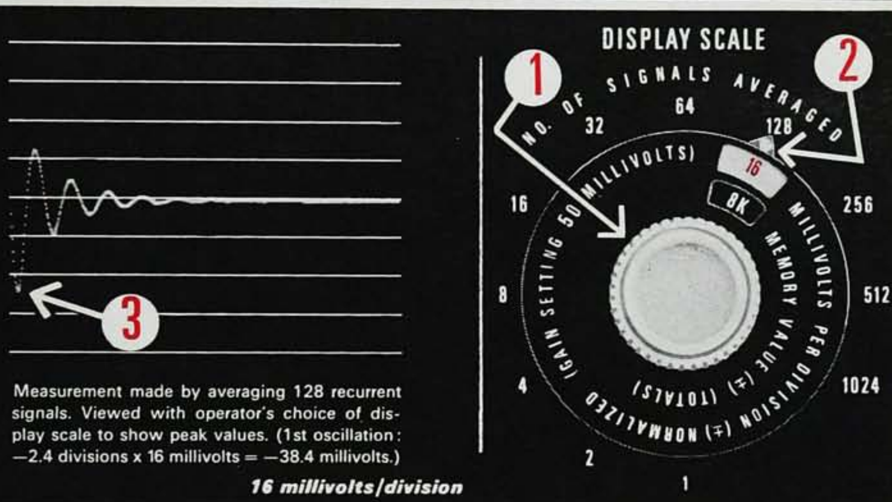
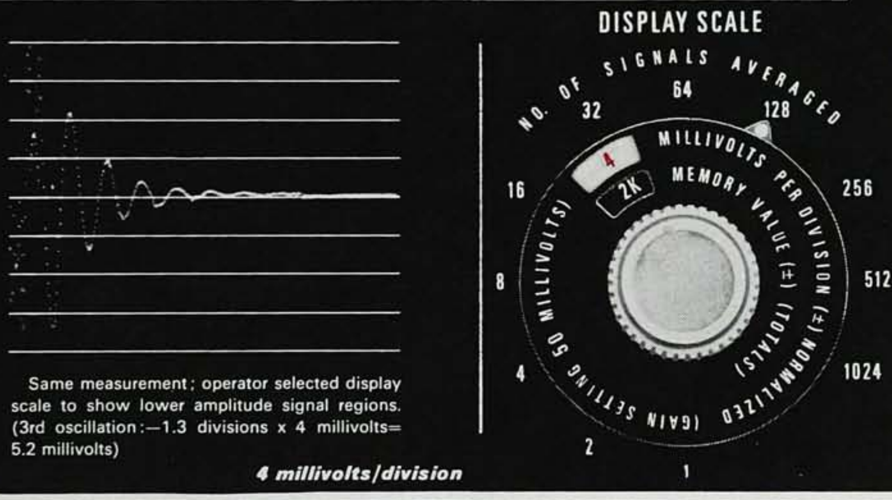




Measurement made by averaging 128 recurrent signals. Viewed with operator's choice of display scale to show peak values. (1st oscillation: −2.4 divisions x 16 millivolts = −38.4 millivolts.)

16 millivolts/division



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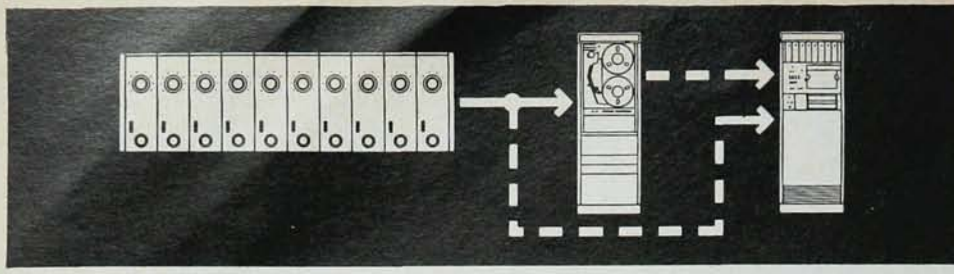

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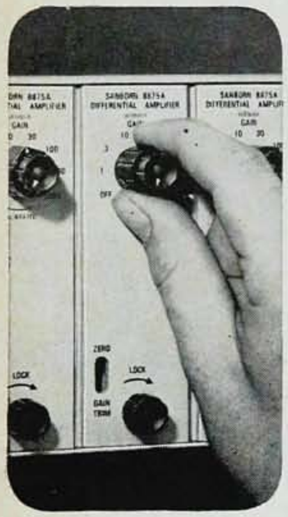

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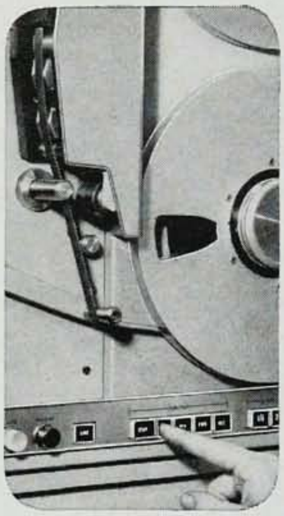

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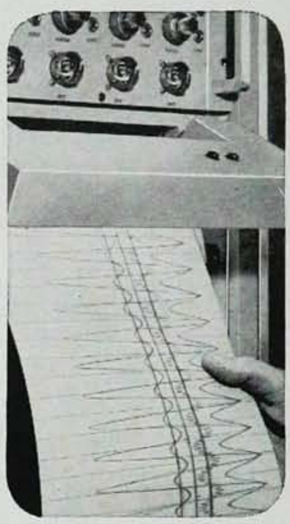

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created within one or two centuries, if not sooner. Such computers could reproduce themselves, using materials from the distant planets. In effect we could colonize other planets without sending any human beings. Then, if we wanted to, we could go to those planets ourselves. In this fashion we could explore stars that are several thousand light-years away.

It is interesting to speculate about why we have not been contacted by computers from other planets. It may be because (a) there is no other civilization near the solar system, (b) other civilizations are also short-lived (?), (c) developed civilizations lose interest in exploration or (d) during the brief span of recorded civilization on earth, other civilizations have not had enough time to contact us (it would take at least 2000 years if the other civilization were 1000 light-years away).

It seems to me that if we are going to be contacted by other civilizations, it will be with small computers rather than by radio. To send a radio wave across several hundred light-years, a distant civilization would have to have a strong power source. In addition it would have to assume that in the direction of the radio wave there existed a civilization (like ours) that was capable of receiving the signal and that was tuned to the proper frequency. Without first sending computers, the other civilization could not be sure of both assumptions. And to send a fairly wide-band signal to many stars for a long time (say about 100 years) would be quite expensive.

It seems more logical, therefore, to send a computer that could fly back to the sender and report on our existence. Then the next computer could carry a taped message and try to contact us. If the computer were knowledgeable, we could question it and determine, for example, the language of its senders. Once the first contact was established, it would be much easier for the other civilization to use radio signals because we would know their direction, frequency and bandwidth and the time of their arrival on earth. □

Shoichi Yoshikawa
Princeton University