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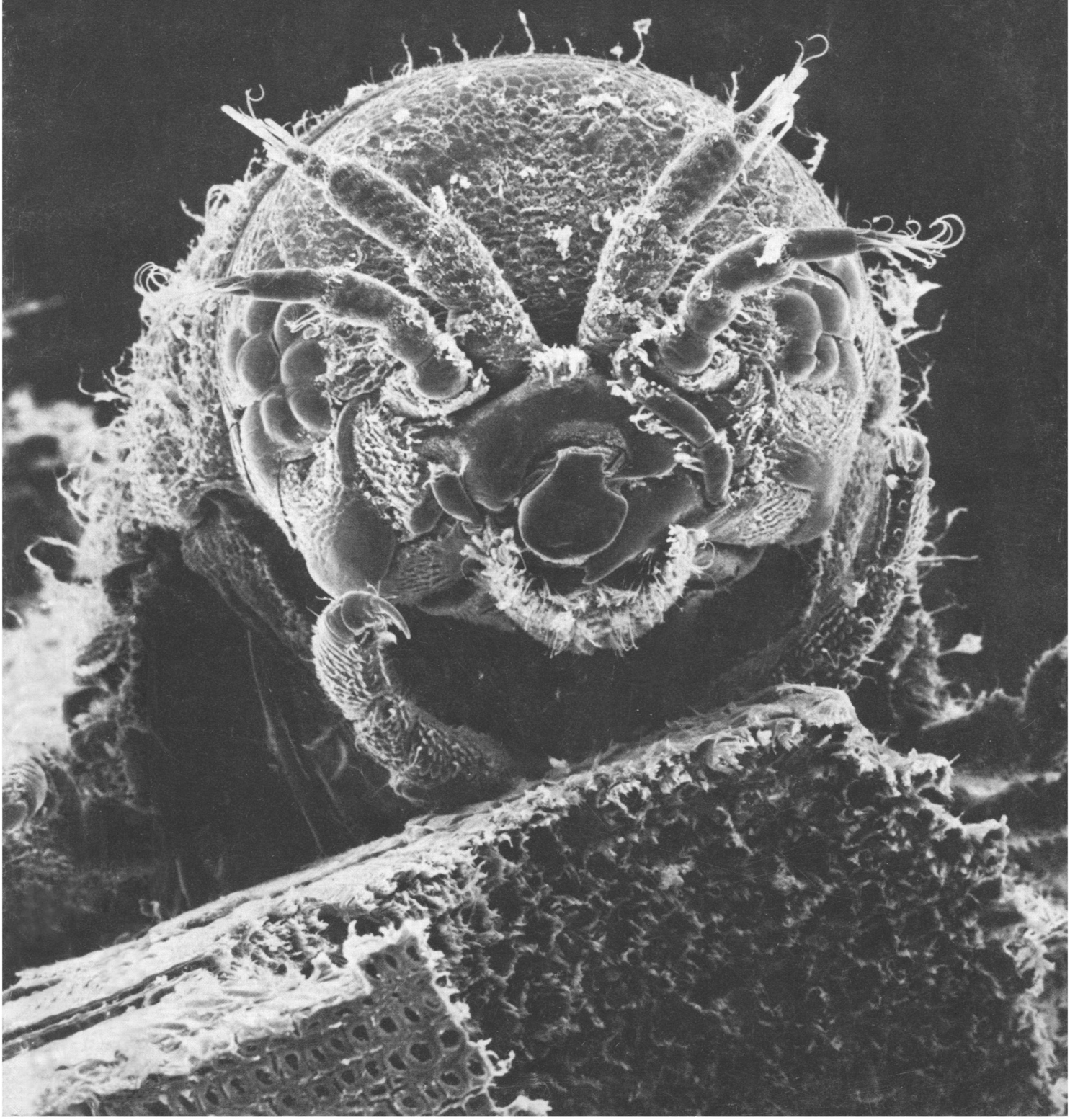

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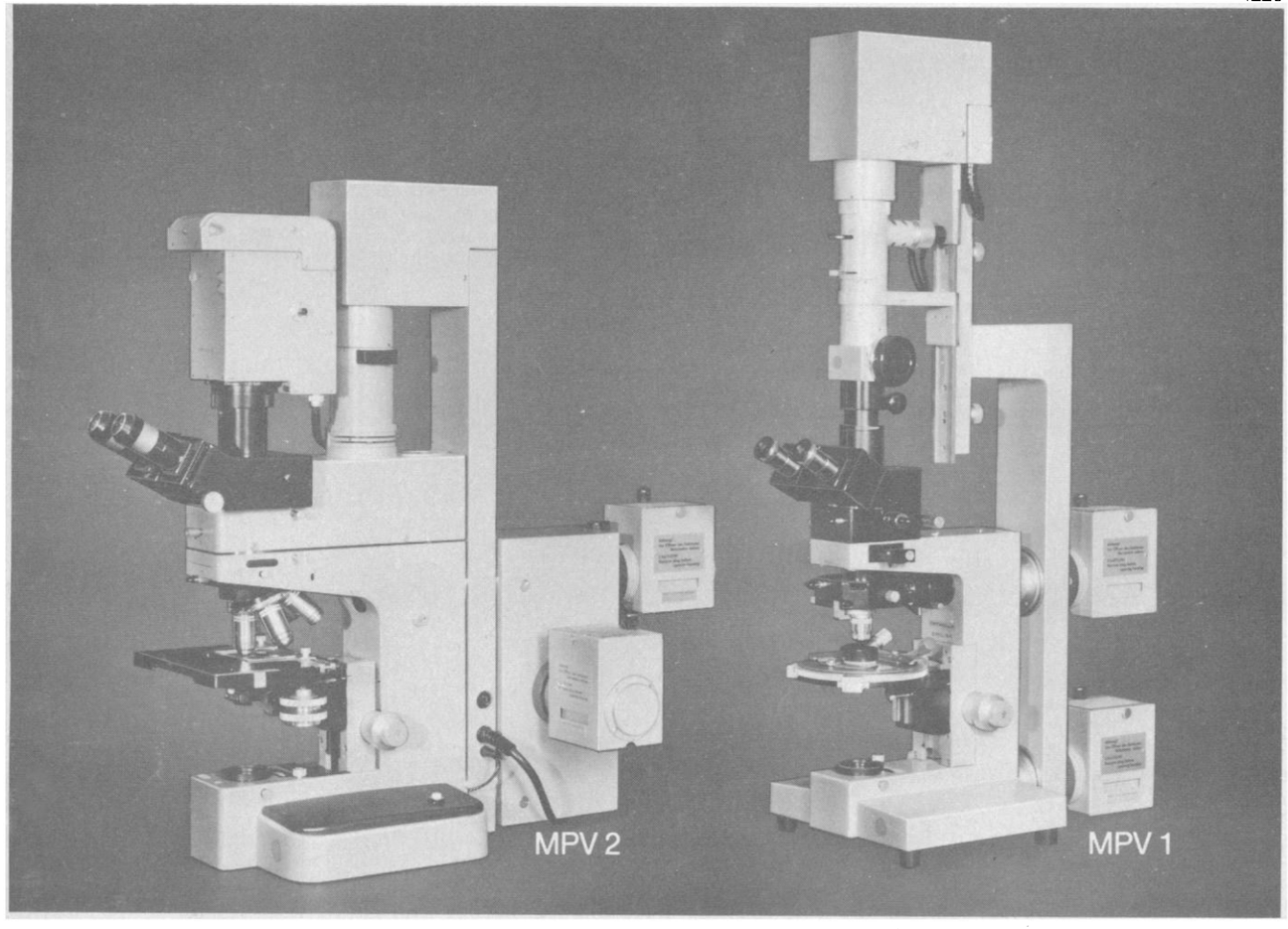

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SCIENCE

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PRODUCTS AND MATERIALS

COVER

The wood-boring marine isopod, *Limnoria tripunctata*, seen emerging from a burrow, maintains a digestive tract free of microorganisms. This phenomenon occurs also in a marine amphipod and a terrestrial isopod. The distance between the eyes is 380 micrometers. Part of another burrow is at the lower right. See page 1157. [P. Boyle, Division of Applied Sciences, Harvard University, and E. Seling, Scanning Electron Microscope Laboratory, Museum of Comparative Zoology]

3rd ANNUAL AAAS COLLOQUIUM ON

R&D POLICY
R&D in the Federal Budget
R&D, Industry, & the Economy

20-21 June 1978
Mayflower Hotel
Connecticut Avenue, NW
Washington, D.C.

The AAAS R&D analysis project, sponsored by the AAAS Committee on Science and Public Policy and initiated in 1976, has resulted in two well-received books on research and development in the federal budgets for FY 1977 and FY 1978, and two highly successful colloquia in June of 1976 and 1977, attended by 200-250 AAAS members, government officials, and others.

The third annual AAAS report on R&D in the federal budget for FY 1979 and including a special section on R&D in industry and its impact on the economy will be the subject of the 3rd AAAS R&D Policy Colloquium. This June colloquium will offer a forum for constructive discussion of current issues in federal and industry R&D with officials of the Executive and Legislative branches and leaders from industry and universities. ***Research & Development: AAAS Report III*** by Willis H. Shapley and Don I. Phillips, will be available for the June 1978 colloquium.

Colloquium Topics

Topics to be discussed by leaders in government, industry, and the scientific and technical community will include:

Federal R&D - Policies and Issues

- **Current Policy Issues in R&D:** Carter administration R&D policies; federal support of basic research; policies for applied research and technology development; the "investment" concept of R&D.
- **R&D Issues in the Budget:** Issues in the FY 1979 budget; issues to be faced for FY 1980.
- **Impacts of Federal R&D:** Institutional impacts of current R&D policies and budgets on universities, federal agencies, laboratories, and industry.
- **Problems for the Future:** Future levels of federal R&D support; management and utilization of R&D funds; over-bureaucratization of federal R&D.

R&D in Industry and the Economy

- **Factors Governing Industry Investment in R&D:** Economic and financial problems; federal policies; federal regulations.
- **R&D and the Economy:** Relationships of R&D investment to future economic welfare; economic justifications for R&D.
- **R&D Investment Required:** Possible industry underinvestment in R&D; the proper level of investment might be determined; what actions industry or government should take.
- **Need for Better Understanding:** Further studies needed; problems of obtaining more meaningful data; possible useful roles of AAAS, its affiliated societies, and of industrial groups.

3rd R&D Colloquium Washington 20-21 June 1978

The third AAAS R&D Policy Colloquium will be held on Tuesday and Wednesday, 20 and 21 June 1978 at the MAYFLOWER HOTEL, 1127 Connecticut Ave., NW, Washington, DC 20036. [Although commercial parking is available in the vicinity of the Mayflower, the Hotel is a short walk from the Farragut North (Red Line) and Farragut West (Blue Line—connecting to National Airport) Metro stops.]

AAAS Colloquium (20-21 June) Advance Registration; enclosed is:

- ☐ **$80** Full Registration (includes lunch on both days, dinner on Tuesday, the R&D: FY 79 Report, and the Colloquium Proceedings)
- ☐ **$45** Partial Registration (includes Report and Proceedings only)
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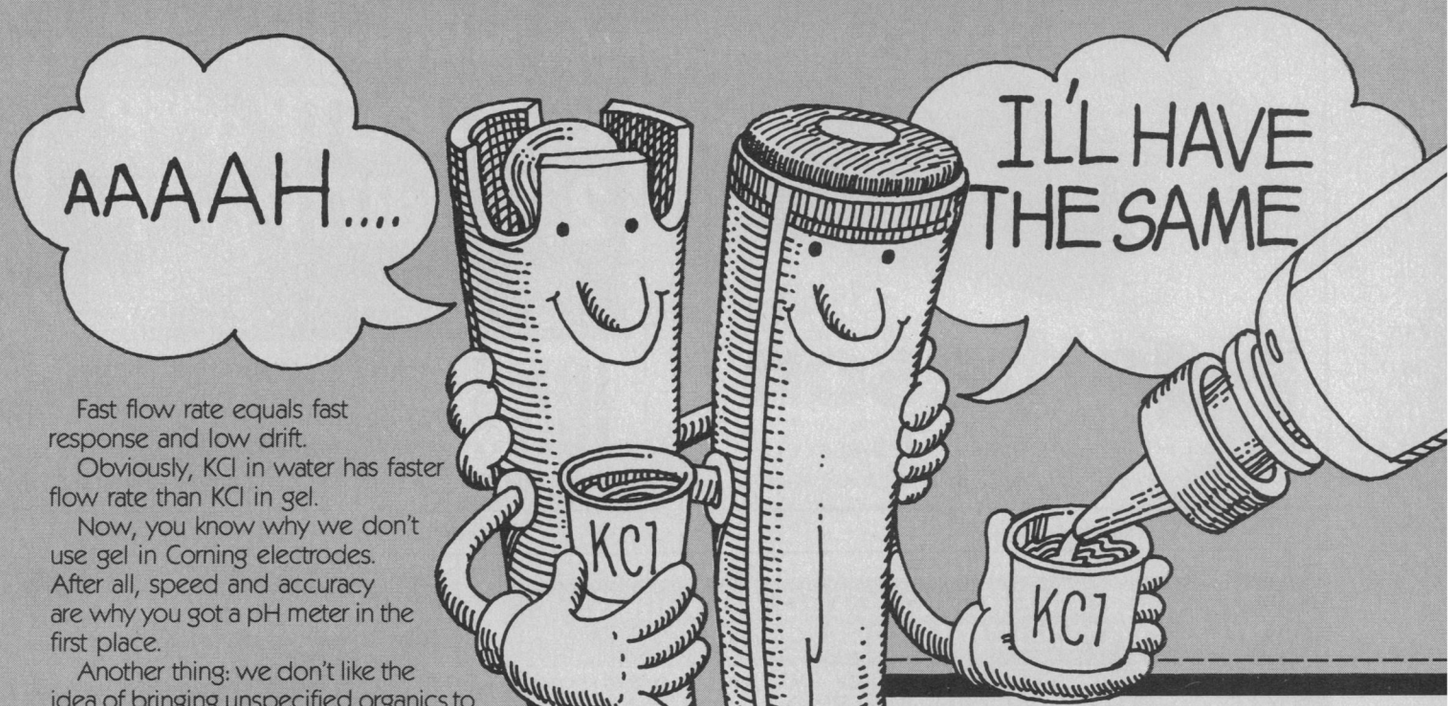

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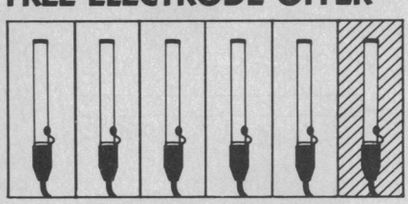

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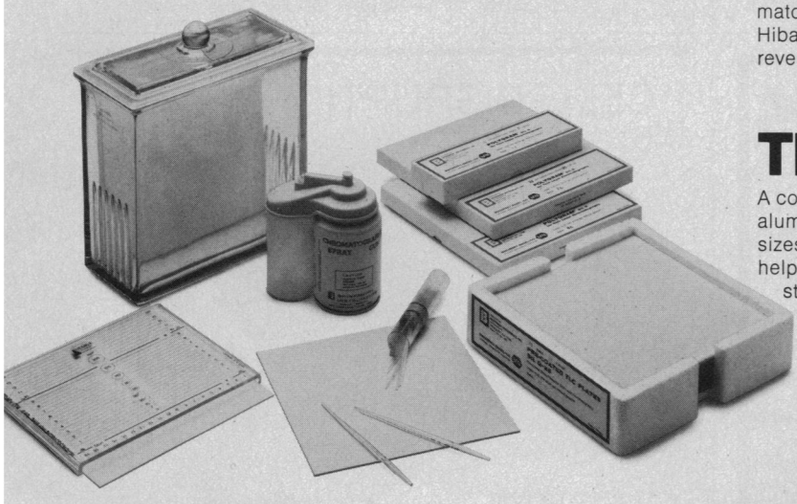

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LETTERS

Sociobiology: The Underlying Concept

Darius Baer (Letters, 28 Apr., p. 382) presents as the "underlying concept of sociobiology and behavioral genetics" the formulation $P = G + E + (G \times E)$, where "P is the measured value for some character of an individual (behavior or otherwise), G is the value conferred upon the individual by its genotype, E is the environmental deviation resulting from all nongenetic causes, and $(G \times E)$ is the deviation resulting from genotype-environment interactions or the differential response of different genotypes to different environments." This incorrectly implies that a phenotypic trait of an individual can be partitioned into distinct genetic, environmental, and interactive components. It is equivalent to saying that if A is 6 feet tall, then perhaps 5 feet may be attributable to his genotype, 8 inches to his environment, and 4 inches to the interaction between the two. In fact, every inch of A's height is due to the interaction of genotype and environment, so Baer's statement is more accurately recast $P = G \times E$.

Presumably, Baer was thinking of the formulation $P_{var} = G_{var} + E_{var} + (G \times E)_{var}$. This statement is conceptually correct, but it refers to the *variance* in a trait; that is, it is true of populations, not individuals. Thus, if we measure a sample of people (of which 6-foot-tall A is one), we can obtain a measure of the variance for height in the population, and with sufficient other information we can also obtain an estimate of the heritability of the trait—the fraction of phenotypic variance attributable to genotypic variance. But by its definition, heritability is a population phenomenon only, saying nothing about individuals. Heritability also says nothing about the extent to which a trait is genetically controlled (its canalization); in fact, traits with a large impact on fitness usually have a very *low* heritability—because additive genotypic variance for such traits tends to be low.

In addition, Baer says, "There are no claims to date by authentic sociobiologists to *definite* race or sex differences. . . ." This is misleading: to my knowledge, no sociobiologist has made any claim whatever concerning race differences. Indeed, since it points to the biological universals shared by all *Homo sapiens*, a field of human sociobiology, if it were to exist, would be a potent antidote to racism. Finally, I object to Baer's implication that sociobiology will have something to say about genetic engineer-

ing. We are left with the image of science and society, linked arm in arm, marching off to greet the Brave New World under the streaming banner of sociobiology. It just isn't so.

DAVID P. BARASH
Center for Advanced Study in the Behavioral Sciences, 202 Junipero Serra Boulevard, Stanford, California 94305

The Icarus Legend

In his review (12 May, p. 673) of D. A. Reay's *The History of Man-Powered Flight* (*1*), Robin Higham states, "Reay conclusively shows that Icarus could not possibly have flown from Crete to the mainland of Greece. Someone needs to reexamine that legend to see what his real objective might have been or whether he might have been under the influence of hallucinogenic drugs." Icarus certainly did not make the flight; he fell into the sea and was killed. Daedalus, father of Icarus, made wings to escape from imprisonment by King Minos and reportedly flew to Sicily, not Greece. Since the distance is approximately 450 miles, he may be suspected of having made the major part of the journey by ship. Hallucinogenic drugs are not the only cause of strange opinions; too much sun may also be harmful.

TERRY F. HUFF
Arkansas Department of Pollution Control and Ecology, Little Rock 72209

Reference

1. D. A. Reay, *The History of Man-Powered Flight* (Pergamon, New York, 1977).

Neuroendocrinology: Pioneering Efforts

In the second of his three articles on Guillemin and Schally, Nicholas Wade (News and Comment, 28 Apr., p. 411) refers to the forthcoming volume 2 of *Pioneers in Neuroendocrinology*, edited by Joseph Meites *et al.* (*1*). He omits, however, any reference to volume 1 of this publication, which is already available (*2*). I wish to call volume 1 to the attention of *Science* readers, particularly the chapter on "Neurosecretion and its role in neuroendocrine regulation" by Berta Scharrer. There we learn that in 1928—when Guillemin was 4 years old and Schally was 2—Ernst Scharrer discovered that certain hypothalamic neurons specialize in secretory activity to a degree comparable to that of endocrine

gland cells; he further suggested that this activity may be related to hypophyseal function. Ever since that time the Scharrers, as a husband and wife team, seriously and with deep commitment pursued their research in this field—Ernst until his untimely death in 1965 and Berta to date, as professor of anatomy and neuroscience at the Albert Einstein College of Medicine. Therefore, I do not agree with Wade's statement that "Geoffrey Harris . . . first seriously urged the idea that the brain must control the pituitary gland. . . ." (News and Comment, 21 Apr., p. 279). That the Scharrers deserve more credit for their pioneering efforts than they have received in *Science* thus far is confirmed by the citation accompanying the honorary degree of Doctor of Science that was given to Berta Scharrer this year by the University of North Carolina at Chapel Hill. The citation includes the statement that the "neuroendocrinologists who won the 1977 Nobel Prize [in Physiology or] Medicine built upon the foundation that the Scharrers had laid."

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References

1. J. Meites, B. T. Donovan, S. M. McCann, Eds., *Pioneers in Neuroendocrinology* (Plenum, New York, in press), vol. 2.
2. ———, *Pioneers in Neuroendocrinology* (Plenum, New York, 1975), vol. 1.

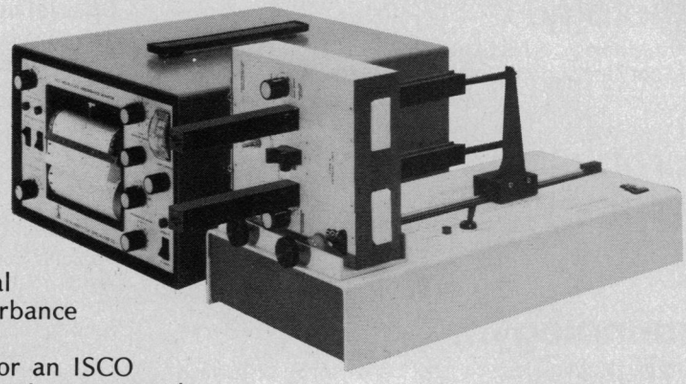
Unidentified Abbreviations

In my book review of 4 November 1977 (p. 498), I took the author of the book in question to task for repeatedly using abbreviations which were unlikely to be familiar to many potential readers. I wrote that he, "leave[s] the unfortunate reader to decide what it could possibly mean to 'call an A.G.M.,' or 'work for the L.C.C.' "

Within a month after the review appeared I had received 15 letters from colleagues across North America who kindly took the time out of their otherwise pressing duties to provide me with the meaning of those abbreviations. In the process they also provided me with justification for my original criticism. All 15 letter writers informed me that "L.C.C." stands for London County Council. Unfortunately, nine of them thought that "A.G.M." stood for Annual General Meeting, and six thought that it meant Assistant General Manager.

RUTH SCHWARTZ COWAN
Department of History, State University of New York, Stony Brook 11790

scan gels with or without staining



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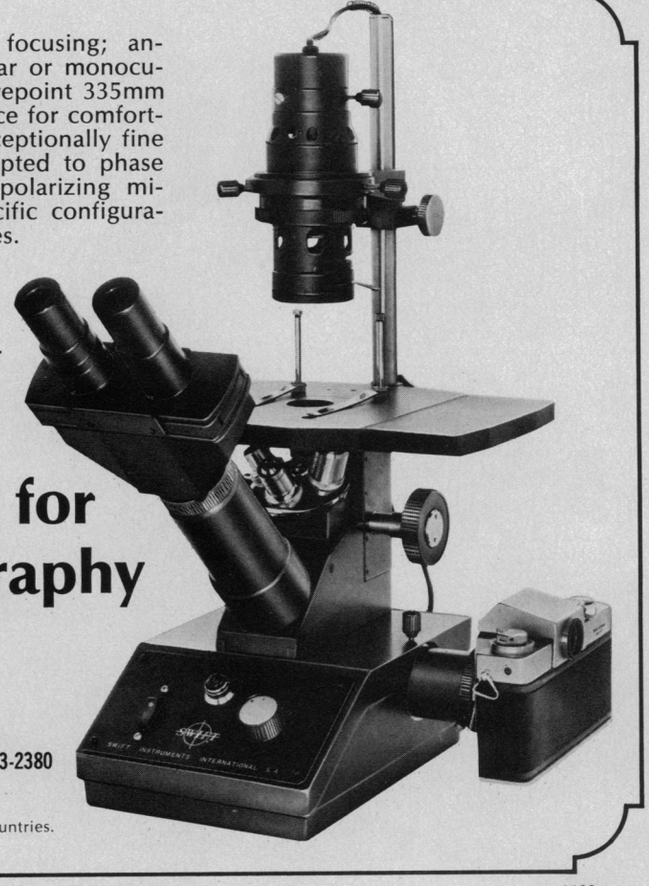

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Obsolete Instrumentation at Universities

At one time university scientists were comfortable in the belief that their institutions were the leading places where fundamental research might be conducted. But now doubts have been expressed. There is concern, particularly among the physical scientists, that the universities have fallen far behind industry in the quality of instrumentation available to them. There is also a fear that students who are using obsolete equipment are not being properly trained.

The performance of the new equipment is much better than that of the older items. Some of the devices make possible entirely new measurements. Others have improved sensitivity. Some permit more precise determinations, while others increase greatly the number of observations that can be made in a given time. In discussing what has happened in his field, a distinguished crystallographer told me that with today's equipment and computational resources his life's work could be performed in less than a year.

Improvements in the various measuring devices have occurred at different times but there have been some common features. One type of advance has come from the use of lasers. This has led, for example, to a great improvement in Raman and infrared spectroscopy. Another type of common feature is the use of dedicated minicomputers for control and data processing with instruments such as gas-liquid chromatographs combined with mass spectrometers. Electronics combined with Fourier transform techniques has in many cases improved the precision of results by an order of magnitude. Improvements across the field of instrumentation during the past two decades have been roughly at the rate of a factor of 10 every 5 years. In general, equipment purchased 10 years ago is obsolete.

In the years up to the late 1960's federal support for equipment was generous. But for more than a decade funds for instrumentation at the National Science Foundation have been inadequate. For example, in 1977 the equipment monies for chemistry totaled $6.5 million. At the same time there were about 14,000 tenured faculty at chemistry departments and about 14,000 graduate students. Only a fraction of the faculty attempts to do research, and other sources of funds are sometimes available, but the order of magnitude nationwide of the average annual equipment support appears to be no more than $1,000 per capita. In contrast, at good industrial research laboratories the annual support per capita is in the range of $15,000 to $30,000. The cost of many of the new powerful instruments is in the vicinity of $150,000 and more. Prospects are that the equipment gap between the universities and industry will continue to increase.

The National Science Foundation has been aware of this problem. But it has had only modest success in convincing Congress of the need for expanded funds for instruments. In what amounts to a desperation move the Foundation has announced a program to establish regional instrumentation facilities. During the current fiscal year a total of about $3 million will be allocated for this program. The exact number of facilities is not yet known, but perhaps five will be created. In later years additional centers would be established. Each center will be devoted to a particular type of instrumentation, such as nuclear magnetic resonance. In principle the instruments will serve the needs of many people and they will surely be scheduled for 24 hours a day, 7 days a week. The effort to make measurements on advanced equipment broadly available is laudable.

But the sums of money earmarked are tiny in comparison with total needs. In addition, creation of the centers will spawn new problems such as management, scheduling, time lost in travel, and frustrating delays for eager experimenters who must await their turn. And an enormous amount of effort will go into the writing of proposals by would-be hosts to the centers.

The desirable solution is an increase by an order of magnitude of the equipment funds budgeted for NSF and NIH by Congress. Without a substantial increase in such support the universities' capability to carry out their educational role will continue to atrophy.—PHILIP H. ABELSON