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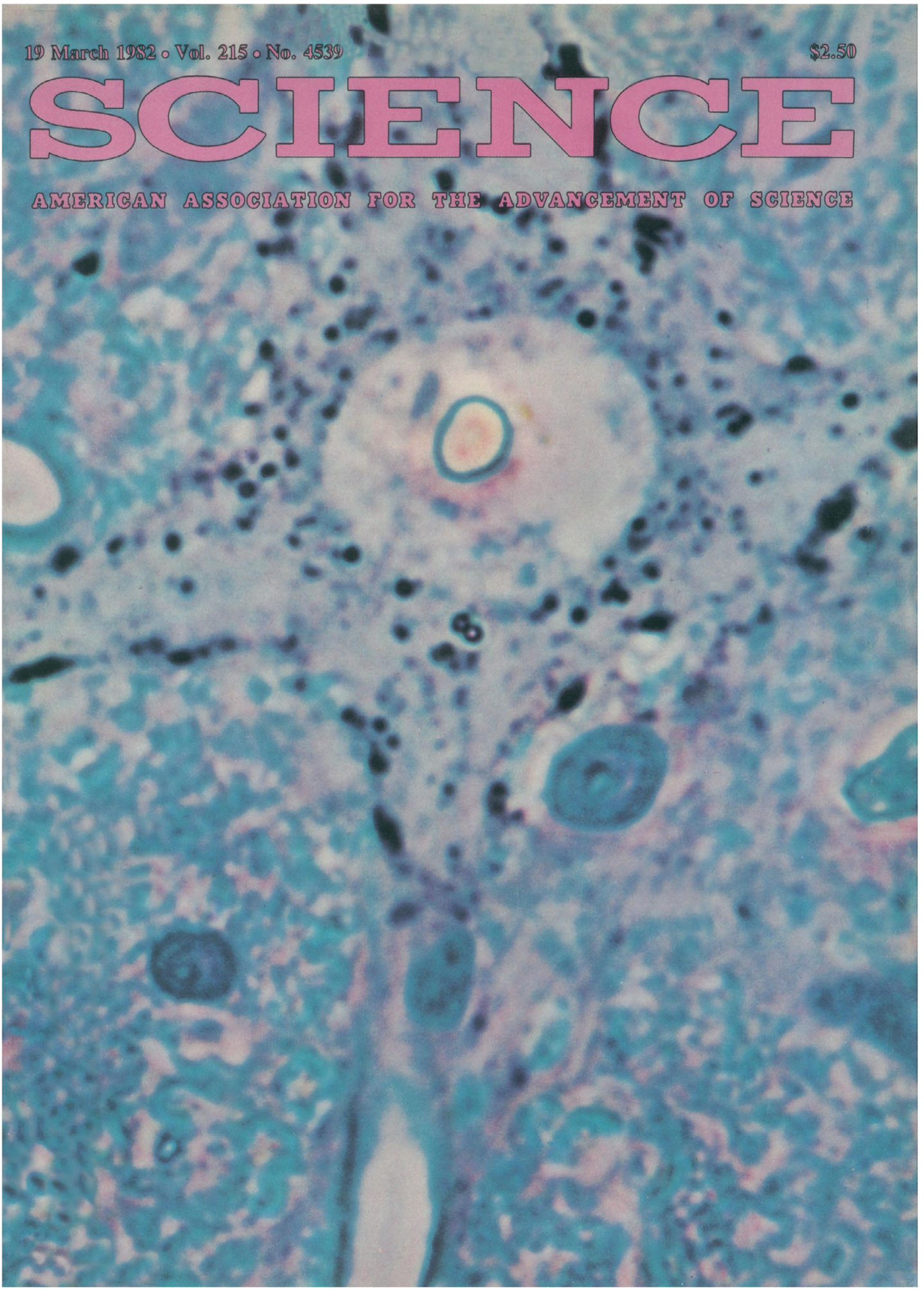

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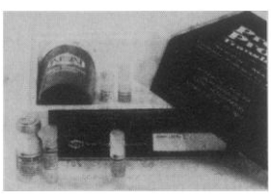

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SCIENCE

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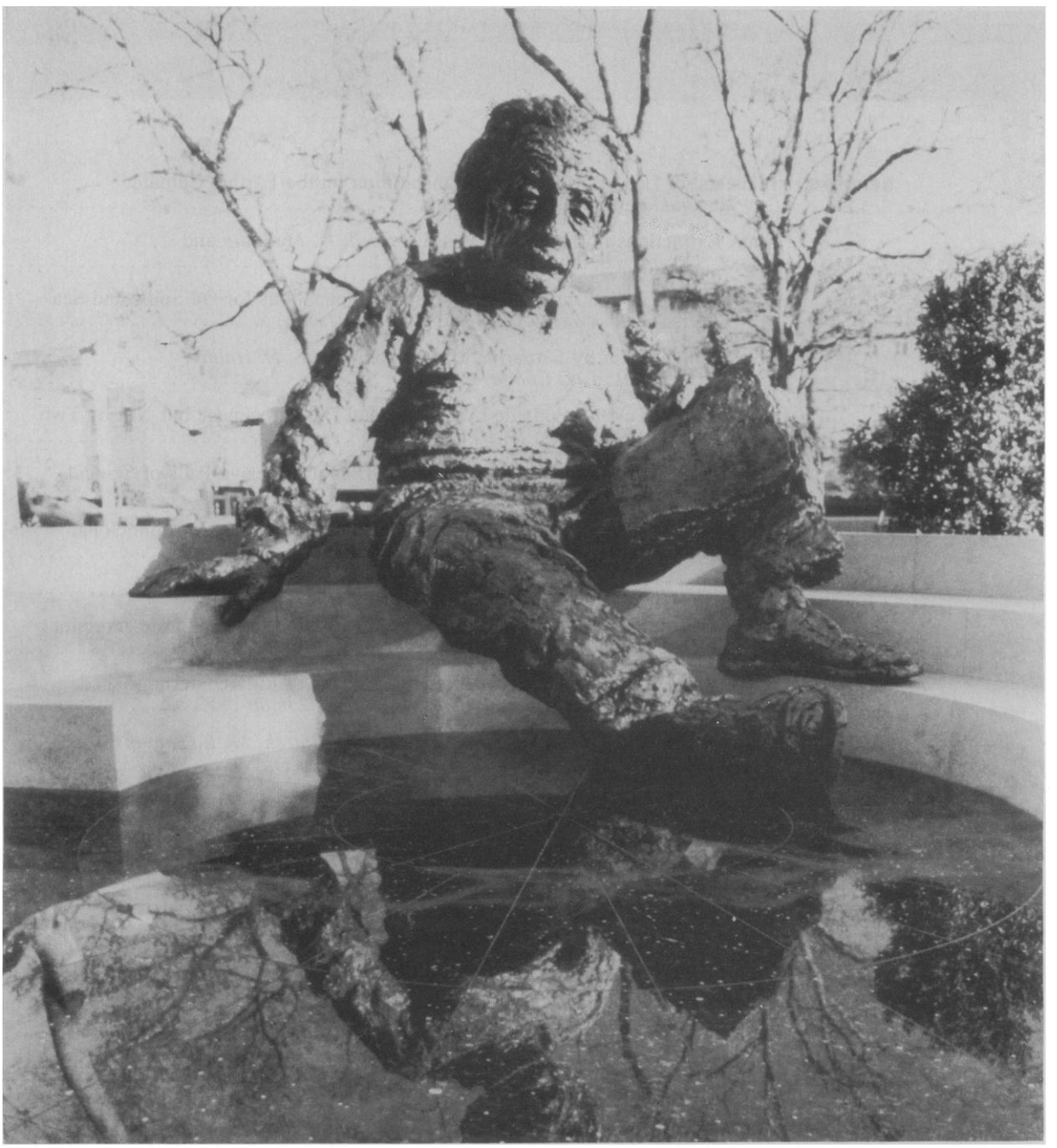
COVER

Phase contrast photomicrograph of dorsal horn thalamic projection neuron surrounded by immunocytochemically labeled enkephalinergic axonal endings. The granular, retrogradely transported horseradish peroxidase is dispersed in the cell's cytoplasm. The presence of enkephalinergic synapses on thalamic projection neurons suggests that opiate modulation of the behavioral response to noxious stimulation occurs directly on the projection neurons (1-micrometer plastic section, counterstained with toluidine blue; about ×3700). See page 1523. [M. A. Ruda, National Institutes of Health, Bethesda, Maryland 20205]



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BIOSYSTEMS UPDATE

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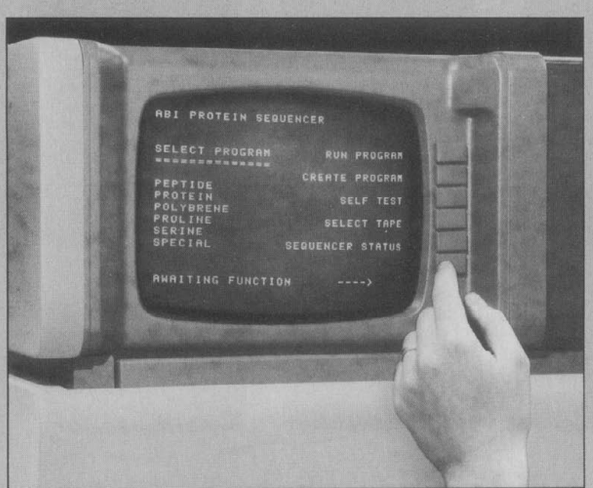
The technologically advanced protein sequencer allows researchers to address many new areas of application. Its sensitivity will be orders of magnitude higher than that currently attainable. It even permits sequencing of samples obtained after electroelution from SDS gels.



Where sensitivity is not needed and samples are available in nanomole or tens of nanomole quantities, larger numbers of residues can be sequenced than with conventional instruments.

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A new Automated DNA Synthesizer based on proprietary phosphoramidite chemistry has been developed. It enables molecular biologists to synthesize, quickly and reliably, large numbers of custom oligodeoxynucleotides in their own laboratories. The stability and high efficiency of this chemistry as implemented by Applied Biosystems allows synthesis of relatively large DNA fragments using very small amounts of starting material. Circle #391.

Other Instruments for use in Biotechnology are being developed by Applied Biosystems. We currently have openings in our Northern California Headquarters for outstanding scientists and engineers with experience in protein and polynucleotide chemistry, purification and separation technologies and in automation of chemical and biochemical processes. Sales and field service personnel are also being sought for various locations throughout the United States and Europe to provide applications and service support for our products. Please contact our Personnel Manager.

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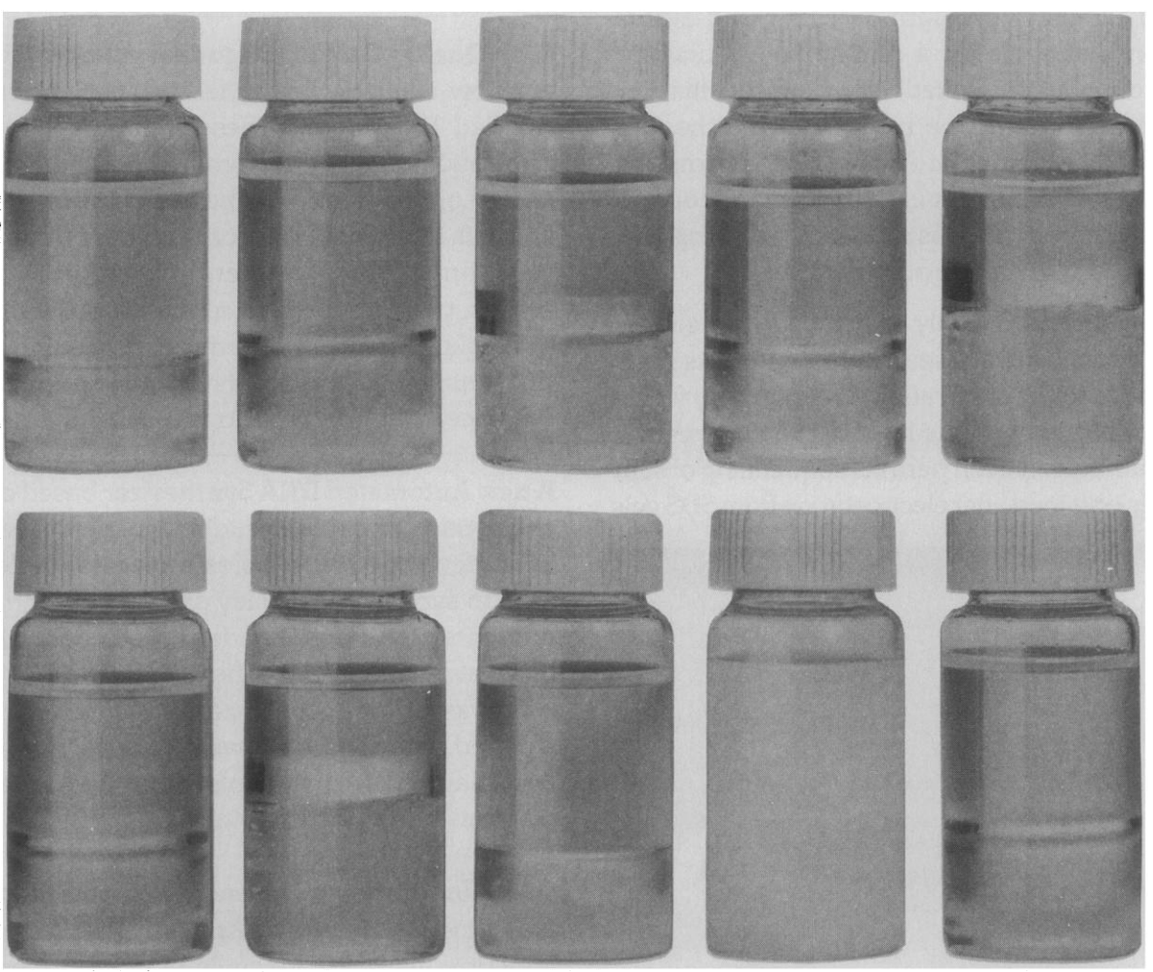

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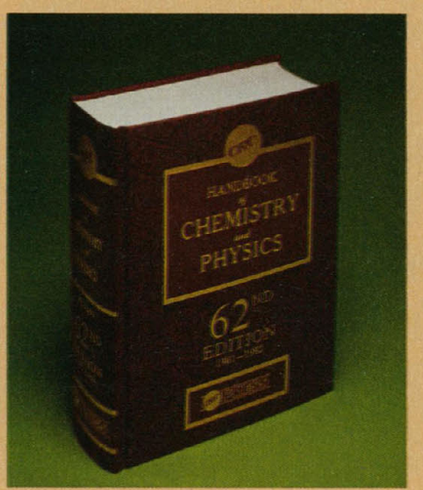

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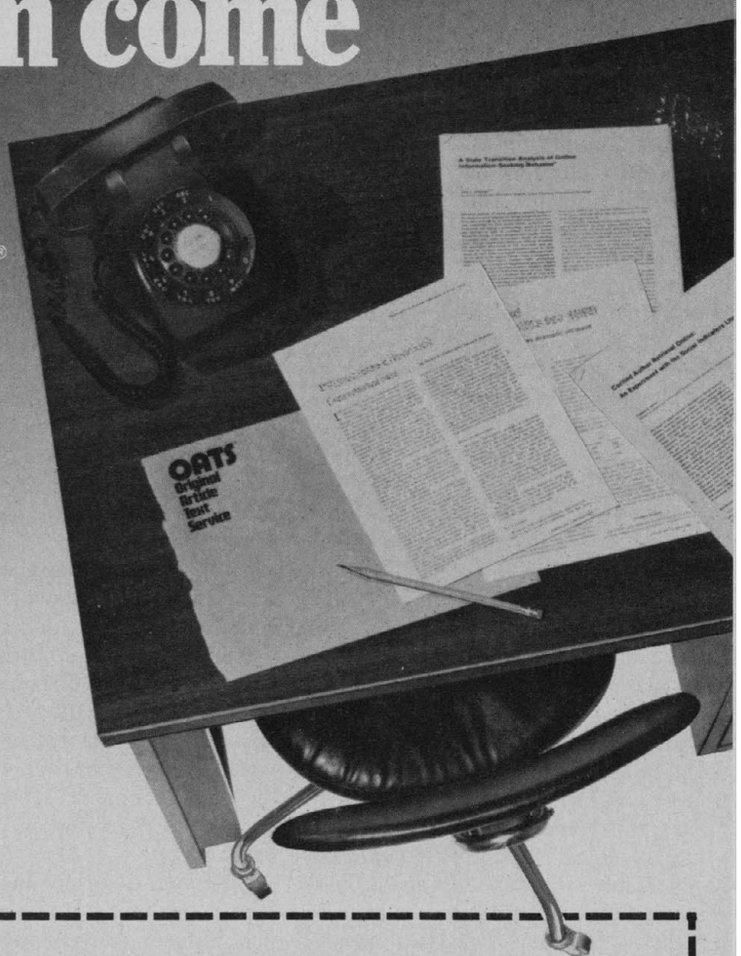

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medical establishment, although he carefully avoids inculpating medical education and its research-oriented goals.

Let there be a national review, and let us not overlook the possibility of separating biomedical research from medical education, thereby restoring traditional ethical qualities to both.

GEORGE A. SILVER

Department of Epidemiology and Public Health, School of Medicine, Yale University, New Haven, Connecticut 06510

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2. B. Barber, J. J. Lally, J. Makarushka, D. Sullivan, *Research on Human Subjects* (Russell Sage Foundation, New York, 1973).
3. A. S. Relman, *New Engl. J. Med.* **303**, 963 (1980).

Haig's Image

The demeanor of Alexander Haig has sometimes seemed more appropriate for a Secretary of War of a bellicose state than for what he is, the Secretary of State of the United States—whose citizens, by and large, long for continued world peace. Now even in *Science* Haig is mistakenly called the Secretary of Defense (News and Comment, 12 Feb., p. 878). Maybe it's time that President Reagan considered changing Haig's title to something more consistent with his public image.

WILLIAM A. ZELLMER

5516 Roosevelt Street, Bethesda, Maryland 20817

Nonsexist Mnemonics

I very much enjoyed the article by M. Mitchell Waldrop (Research News, 5 Feb., p. 647) on the Orion Nebula. However, in an era when we are finally encouraging more women to go into astronomy (and E. Margaret Burbidge is president of the AAAS), we really should stop perpetuating the old-fashioned (and some would say sexist) mnemonic he cites for the spectral types of stars.

Some years ago, at the suggestion of Owen Gingerich at Harvard, the Astronomical Society of the Pacific ran a contest to find a new mnemonic (*1*). The most popular suggestion was just a small change in the traditional version, to "*O*h *B*e *A F*ine *G*irl (or *G*uy), *K*iss *M*e." Another good prospect, at least for those in academic environments, was "*O*h *B*oy, *A*n *F G*rade *K*ills *M*e." Among the other noteworthy entries was one which seemed self-referencing, "*O*dd *B*all *A*stronomers *F*ind *G*enerally *K*ooky *M*nemonics."

Our favorites for the longer version, OBAFGKMRNS, included: "*O*bese *B*alding *A*stronomer *F*ound *G*uilty: *K*illed *M*any *R*eluctant *N*onscience *S*tudents"; "*O*h *B*ring *A*nother *F*ully *G*rown *K*angaroo: *M*y *R*ecipe *N*eeds *S*ome"; and "*O*nce *B*eer *A*ges, *F*lavor *G*ives *K*ind *M*en *R*ather *N*aughty *S*miles."

Perhaps *Science* readers will have additional suggestions.

ANDREW FRAKNOI

Astronomical Society of the Pacific, 1290 24th Avenue, San Francisco, California 94122

Reference

1. See *Mercury* **6** (No. 4), 21 (July/August 1977).

Successful Conference

With reference to the briefing "Israeli denied visa for conference in India" (News and Comment, 17 July, p. 312), we are pleased to report that the International Conference on the Applications of the Mössbauer Effect, which was postponed until 14 to 18 December, has taken place in Jaipur, India. All scientists who wanted to attend were granted admission.

The conference was attended by about 175 Indian scientists and about 150 from other countries and was very successful. The large number of Indian scientists attending reflects the widespread research in India using Mössbauer spectroscopy techniques.

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Erratum: The correct price for *The Grant Swinger Papers* (News and Comment, 26 Feb., p. 1081) is $4.95 including postage and handling.

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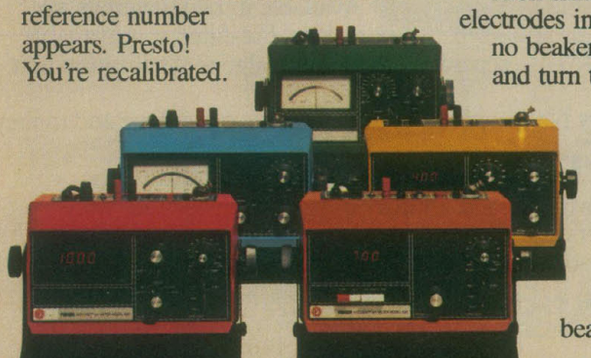

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19 March 1982, Volume 215, Number 4539 **SCIENCE**

Engineering: Lessons from Medical Schools

The challenges that exist in engineering education and engineering research are widely recognized. National sources of funding and of fellowships are critical. However, universities and their schools of engineering also need to look within to meet these challenges. The crux of the crisis may well be the awkward status of many engineering schools as hybrids more like academic departments than like professional schools.

From the vantage points of the Office of Science and Technology Policy and the Office of Management and Budget during the Carter years, I noted significant lessons for engineering from recent restructuring of medical schools.

No one would consider a modern medical school education complete without experience in hospital and clinic settings to complement academic work. The same should apply to advanced engineering education and experience in industrial research settings. Such arrangements widen the curriculum to include practical problem-solving, which in turn often reveals gaps in basic knowledge. Providing such options would counteract the criticism that many graduate engineering programs are too narrow or too theoretical, would stimulate industrial support, and would attract advanced students.

Most medical schools have full-time academic faculty members who work in research laboratories established or expanded at affiliated hospitals. Some of these laboratories are distant geographically or professionally from the schools, and faculty have often viewed these situations as less desirable. Nevertheless, the creative development of new ties and useful facilities has made it feasible for university medical centers to build up new programs and attract faculty who are capable of competing for outside support.

Some engineering faculty members already perform research in industrial laboratories, research institutes, or contract research groups outside the academic structure. These extra-academic arrangements provide salary supplements, special research challenges, and access to better equipment, while ensuring adequate protection of proprietary interests. More opportunities may exist for such arrangements, and they should be assessed as an alternative to losing or failing to recruit faculty members.

Universities will have to recognize and tolerate the professional status and incomes of such engineering faculty. In turn, faculty with off-campus activities must honor their primary commitments and fulfill their responsibilities within the university community. As most medical school faculty can testify, this scheme is a formula for long hours and hectic schedules.

In most medical schools, selected full-time practitioners form a "clinical faculty" who supplement the teaching of the full-time academic faculty and give students a wider experience in medical training and practice. The clinical faculty typically exchange their time and access to their patients for the prestige and stimulation of the university medical center affiliation.

The potential for a counterpart of the clinical faculty in engineering is quite real. The stronger the academic faculty, the more likely they will be to interact comfortably with professionals outside the academic community. In a time when the popularity of engineering fields and the teaching loads are changing rapidly, schools should value the flexibility to expand teaching without making long-term academic commitments.

Schools of engineering vary in their interests, circumstances, traditions, and geographic proximity to industrial or government laboratories. Each school must clarify its goals and its preferred mix of theoretical and applied work. Medical schools were in similarly diverse situations when they devised clinical relationships and expanded research. Institutional planning, not just national leadership, is needed to restructure many engineering schools so that academic and professional objectives can be addressed and both kinds of activities can flourish.—GILBERT S. OMENN, *Science Policy Fellow, Brookings Institution, Washington, D.C. 20036 and Professor of Medicine and of Public Health, University of Washington, Seattle 98195*

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