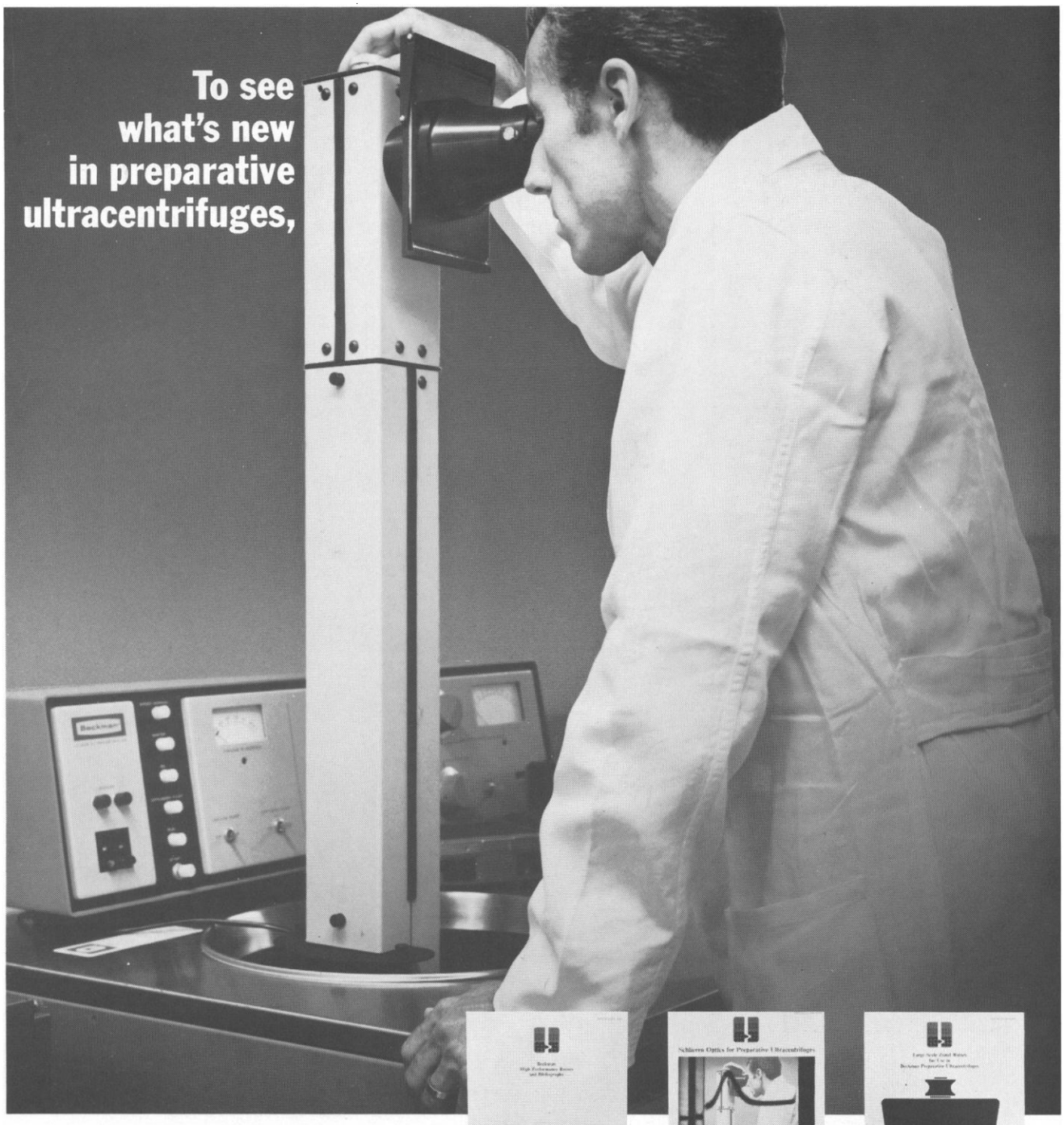
SCIENCE

28 February 1969

Vol. 163, No. 3870

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



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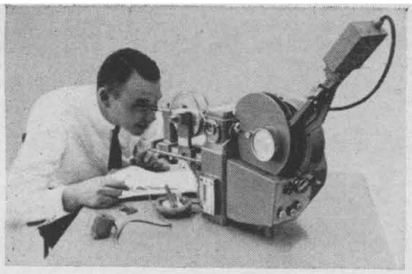

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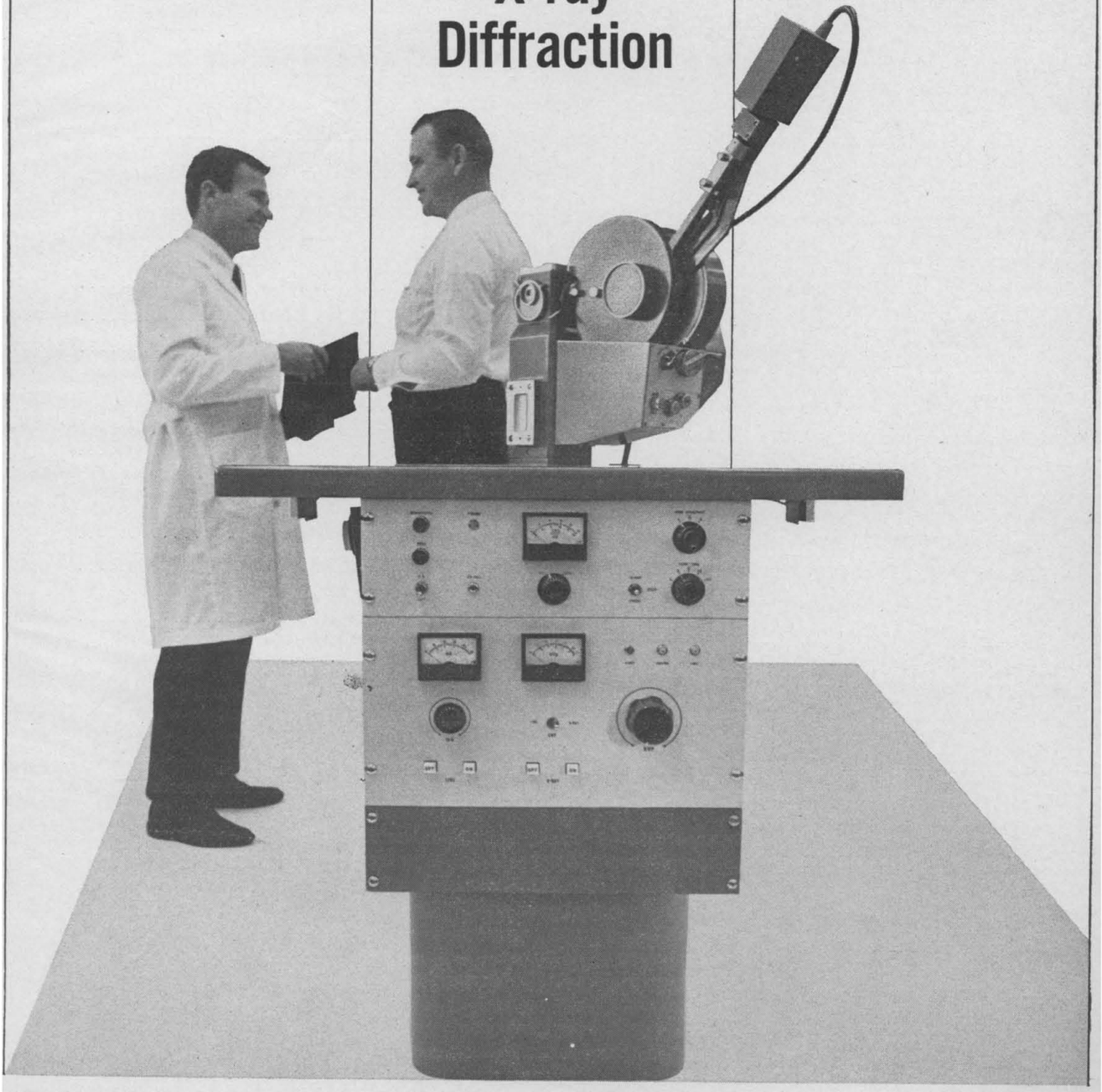

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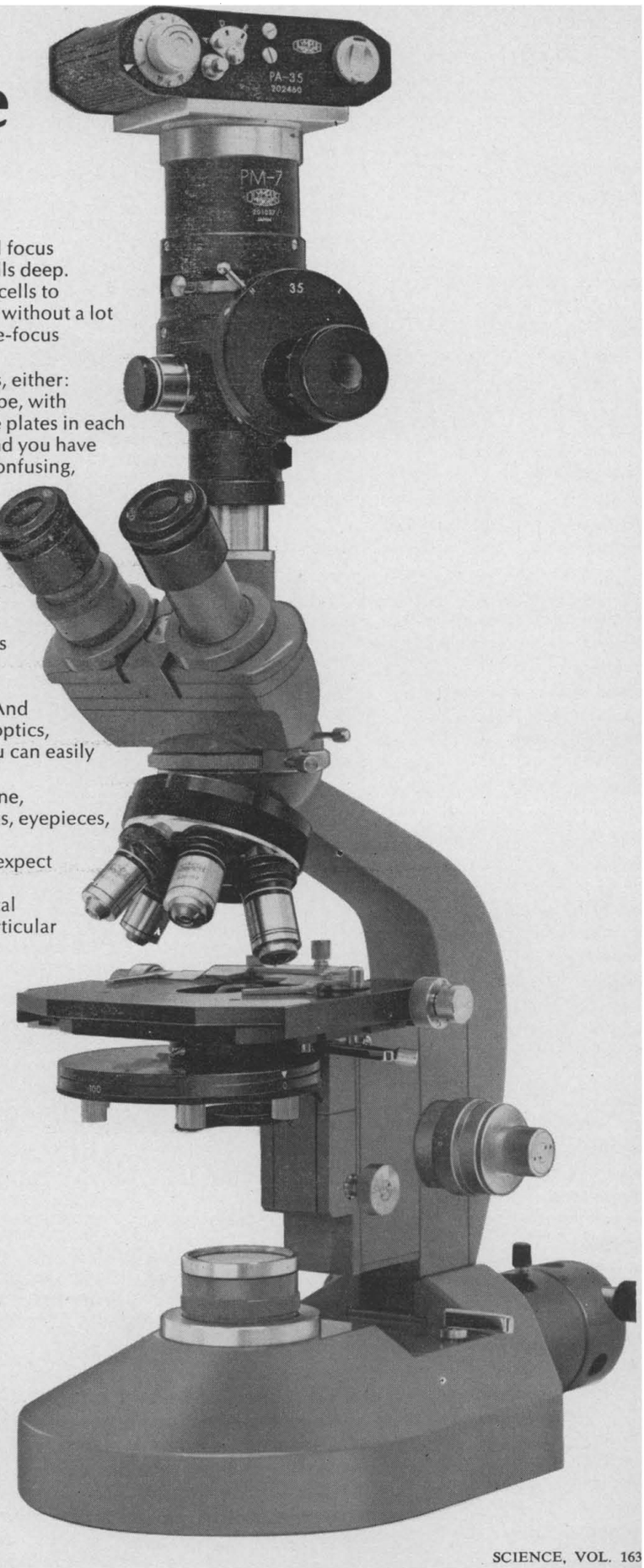
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

COVER

Blowhole of "Baby Jean," pilot whale (*Globicephala scammoni* L.). Airflows greater than 150 liters per second and exchange of as much as 40 liters of air are achieved with a passive expiration. See page 953. [Frank C. Hale, Respiratory Research Laboratory, Veterans Administration Center, Los Angeles; Department of Physiology, University of California at Los Angeles School of Medicine]

The fiddle-free phase scope.



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puses, it seems to me even more important than before that a comprehensive and careful examination of this entire phenomenon be initiated. Indeed, it is unfortunate that we don't now have more knowledge than noise, and more reason than rhetoric. When we reach that constructive stage, all liberalism—creaking, rusting, and otherwise—will be better served.

ELI A. RUBINSTEIN
National Institute of Mental Health,
5454 Wisconsin Avenue,
Chevy Chase, Maryland 20203

Lebensraum: A Correction

Dumey's remarks (Letters, 6 Dec.) on the 400-meter separation between people are correct. Unfortunately, one part of the text of my article was missing when given for publication. The paragraph in "Man's movement and his city" (18 Oct.), p. 331, col. 1, para. 1, line 8 should read, "The theoretical distance between any two persons on the earth's surface, if the whole population is spread evenly over the habitable land is 114 meters, over the whole land area is 210 meters, and over the whole surface of the earth is 400 meters."

C. A. DOXIADIS
Doxiadis Associates, 24, Strat.
Syndesmou Str., Athens 136, Greece

Czech Christmas Greeting

At Christmas and New Year's we all send and receive seasons greetings more or less mechanically because it is traditional and we want to be polite. We glance at the cards we receive but rarely read the standard printed message. One which I *did* read this past season was the message of the members of the Institute of Macromolecular Chemistry of the Czechoslovak Academy of Sciences and I was struck with admiration for their selection of a greeting to their friends this year. It was written 300 years ago by J. A. Comenius who declared that man's love for liberty "can by no means be driven out." Yet there were powers in 1968 who refused to accept that truth! The Czech greeting quoted Comenius as follows (*1*):

> 13 The more powerful people then betook themselves to another method of assuaging the strife of men: they sought by attacking whole nations and subduing and reducing them to subjection, to establish whether in the state or in the realm of religion a single order or rule which should embrace them all; but always, as unvarying experience proves, rather with the effect of making things worse than with any good result. For there is inborn in human nature a love of liberty—for liberty man's mind is convinced that it was made—and this love can by no means be driven out: so that, wherever and by whatever means it feels that it is being hemmed in and impeded, it cannot but seek a way out and declare its own liberty. Inevitably resistance, opposition, rebellion follow whenever force becomes an element in the government of men.

WALTER R. RUSTON
64, Avenue Emile Duray,
Brussels 5, Belgium

Reference

1. J. A. Comenius, *The Way of Light* (Amsterdam, 1668).

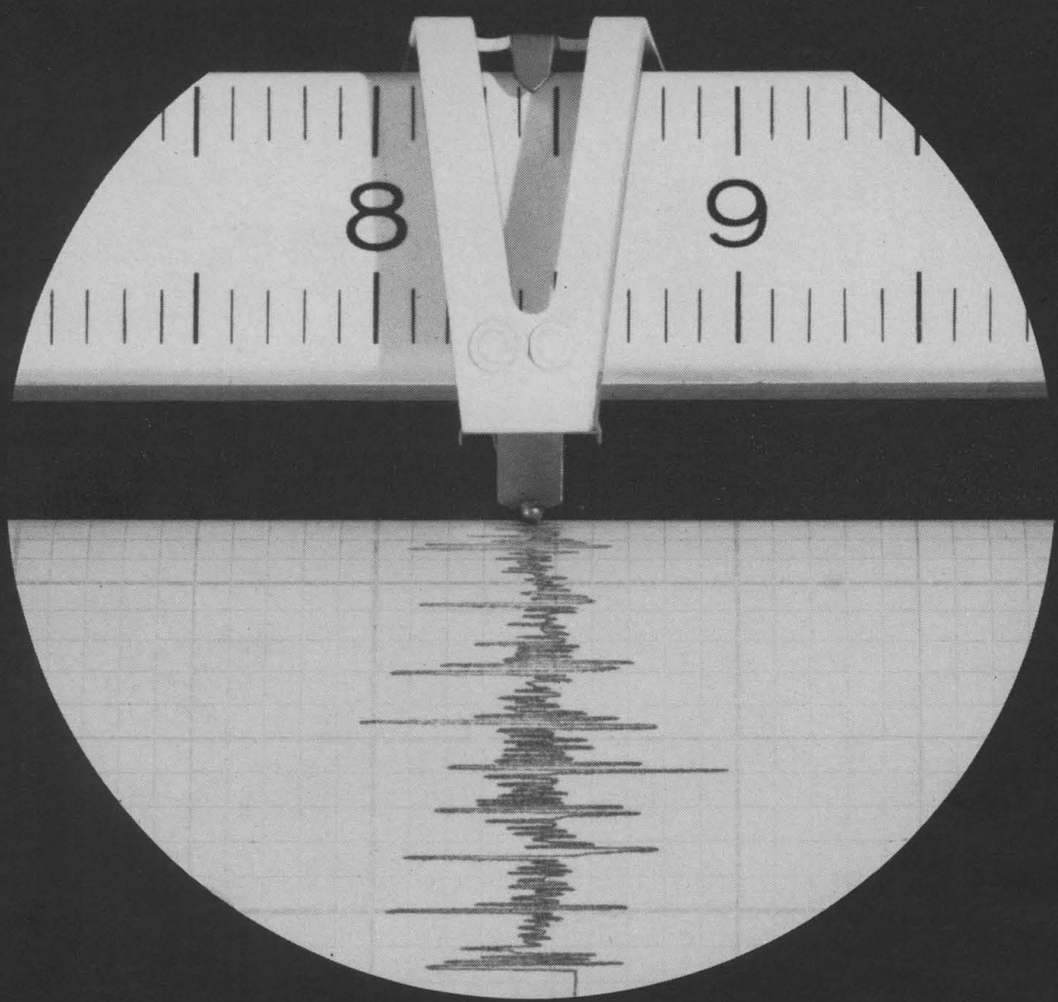
Progress in Metric Conversion

The concept that international conversion to the metric system is a worthy pursuit deserves support (Weber, Letters, 29 Nov.). The efforts of relevant U.S. agencies, including the National Bureau of Standards, to obtain conversion were discussed earlier by Wolfle in his editorial ("Adoption of the metric system," 9 July 1965, p. 139).

This research unit in the New York State Department of Mental Hygiene has found conversion to the metric system to be feasible and has been using it for at least 2 years. The Vincent Astor Diagnostic Service was recording height in centimeters and weight in kilograms as of July 1965, and as of September 1965, the New York Hospital, New York, was employing the metric system for weight, height, and temperature recording. A survey of public and private institutions in the fall of that year indicated that these units were converting from a mixture of pounds and inches to metric measurements of weight, height, and temperature of patients. What has been transpiring since then we do not know. Our own experience has been that the metric system is highly desirable for research. Finally, it is apparently not generally recognized that scales are available for measuring height in centimeters and weight in kilograms, and thermometers for measuring in the metric Celsius system.

JOHN R. WHITTIER
Institute for Psychobiologic Studies,
Creedmoor State Hospital,
Station 60, Jamaica, New York 11427

SEMPER PARATUS



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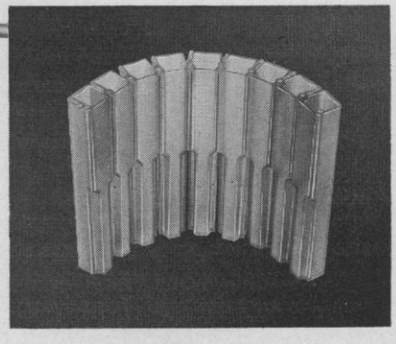

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28 February 1969, Volume 163, Number 3870

SCIENCE

Proliferation of Bureaucracy

Federally operated programs providing assistance to the American public number more than 1000 and cost more than $20 billion annually. In the field of education alone, there are at least 490 programs sponsored by 20 agencies. Representative Roth (R–Delaware) has listed 211 programs for college or graduate students; he states that no one knows precisely how many government assistance programs exist. In keeping with the increase in number of programs during the 1960's, there has necessarily been a growth of bureaucracy in Washington. What is worse, there has been a corresponding proliferation of bureaucratic activity in thousands of institutions and local government units.

This proliferation has occurred for three reasons. First, the local unit must have the means of becoming aware of federal programs. Second, there is a massive amount of paper work involved in applying for grants. Finally, there is the problem of accountability.

Numerically, the most extensive bureaucratization is in local government, where nearly 100,000 units compete for federal funds. However, the colleges and universities have also been affected. The smaller colleges and universities find it particularly difficult to compete for funds. At the large universities problems are not so great. These institutions can afford to support the needed staffs. Moreover, many of their faculty members serve on various federal panels and are a valuable source of information for their universities. Some universities operate what might be called an intelligence network. Faculty members returning from Washington prepare written reports on information they have gleaned. Because of their superior connections, the large "have" universities are in an excellent position to exploit changing opportunities. The amount of staff effort need not be large relative to the funds obtained. In contrast, the smaller institutions having poor contacts with Washington find it difficult to operate there very well, and must devote a disproportionately large effort to the study of federal programs.

To those not well versed in preparing grant requests, the great variety of requirements is irritating and frustrating. The man who becomes accustomed to furnishing information to one agency finds that another has totally different forms. Even within some agencies different programs have different requirements.

Other sources of irritation are the variable practices with respect to accountability and to changes in plans for procuring equipment. There are differences in the definition of what constitutes equipment and in rules concerning its ownership. The rules of the various agencies as to what is allowable as an expense are at times inconsistent. Indeed, auditors from the same agency have at times been inconsistent.

The bureaucracy that has been forced on universities is costly in three major ways. There is, of course, the cost in money to support it, which ultimately must be paid by Washington. A second cost is a deterioration in the intellectual atmosphere of the university. A third cost is the fact that university irritation at the time-wasting inefficiency of some aspects of the grants system destroys respect for the federal government.

Few scientists feel that a single Federal Department of Science is the answer to these problems, but most agree that greater uniformity of procedures among agencies is highly desirable and would save a great deal of money and friction. A thorough review leading to consolidation of some programs and an effort to produce more uniform regulations should be given a high priority by the new administration.

—PHILIP H. ABELSON

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SURGICAL MODIFICATIONS	Adrenalectomized Castrated Ovariectomized Hypophysectomized Thyroidectomized Parabiosis	Adrenalectomized Castrated Ovariectomized Hypophysectomized Thyroidectomized Parabiosis	Adrenalectomized Castrated Ovariectomized	Adrenalectomized Castrated Ovariectomized
AGE OR SIZE GROUPINGS	13 groups (from about 60-360g)	13 groups (from about 60-360g)	Weanlings, and up to 6 weeks (older also available)	Weanlings, and up to 6 weeks (older also available)
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One of the things that behavioral science can contribute to medicine and medical education, and maybe the most important contribution it can make, is to turn its attention to who goes into medicine and what qualities they should have. It may be that not all medical students should have the same medical school experience. The medical school has evolved so that it is no longer a school but it is of itself a university. And no one really expects graduates of a university to have the same kind of experiences.

There is the companion problem of professional identification for people who go into the behavioral sciences, the kind of politics that goes along with professionalism. If the field of behavioral sciences is to be viable in the medical setting, it must keep in touch with the primary motivation of students going into medical training, namely the care of patients.

The role of behavioral sciences in the medical school, up to now, has been a specialized role, carrying out behavioral science instruction in the medical setting or training researchers in behavioral sciences in the medical setting, or the training of people for service in specialist roles. But the question is whether behavioral sciences have a role in the general medical education of students and whether the behavioral sciences, along with biochemistry and physiology, will be part of the basic training of all medical students. Behavioral sciences in medical education are important because they provide a means by which medicine can respond better to the contemporary public issues in the health field. We have accepted the principle that universities and medical education are supposed to respond to public need as the true basis of a public institution. In order for this response to be effective in contemporary affairs the behavioral sciences must be an integral part.

Behavior, both personal and social, is an important component of the life of an individual, whether well or sick. Its appraisal and assessment at the time of the first contact between patient and

physician, in the formation of the diagnosis, and in the planning of treatment is most important. As treatment goes on and as follow-up treatment ensues, the assessment of behavior and plans for its adjustment and integration in the family and community shift from the intrapersonal to the interpersonal or social-group level.

We must develop programs to enhance the understanding by physicians and behavioral scientists of the doctor-patient relationship and the interaction between the patient and his social environment. At the same time it is to be emphasized that this will provide a unique opportunity to expose behavioral scientists, especially graduate students in behavioral science, to the behavioral and social problems inherent in the field of medicine.

J. H. U. BROWN
National Institute of General Medical Sciences, National Institutes of Health, Bethesda, Maryland 20014

Laser Scattering

Approximately 130 scientists attended a symposium on laser scattering in honor of the late Peter J. W. Debye held at Cornell University, 24 to 26 June 1968, under the auspices of the Physical Chemistry Division of the American Chemical Society and the Chemical Physics Division of the American Physical Society. F. A. Long (Cornell University) delivered the opening remarks. Attending the banquet on 25 June were three generations of the Debye family. A. M. Bueche (General Electric), a former student of Debye's, was the after-dinner speaker.

Participants at the conference considered problems related to laser spectroscopy in chemistry and physics with emphasis on techniques which take advantage of the coherent properties of lasers. Speakers drew attention to the use of lasers in physical science; however, they also discussed increasing potential of lasers for research in physics and chemistry as well as in engineering and biology.

Laser research and development have proliferated at a great pace in the last few years. The design and use of lasers draw on experience and knowledge in fields related to physics, such as quantum electrodynamics, electronics, and optics. Consequently, the symposium not only provided opportunities for the exchange of ideas among experts, but

more importantly, it also allowed the novice to learn various aspects of laser scattering from the most able investigators. In order to encourage informal presentations and discussions, it was decided that no proceedings would be published for this conference.

S. H. Bauer (Cornell University) and W. R. Bennett, Jr. (Yale University) reviewed molecular excitations leading to nonequilibrium distributions and the relaxation processes of excited states in atoms; J. R. Airey (Avco) reported on chemical lasers pumped by reactions between halogen atoms and halogen halides. A. Javan (M.I.T.) discussed studies of molecular vibrational relaxation and processes of energy transfer in carbon dioxide.

Stimulated effects resulting from the use of pulsed lasers were discussed by D. H. Rank (Pennsylvania State University) and R. Y. Chiao (University of California, Berkeley). P. D. Maker (Ford Motor Company) reported on inelastic harmonic light-scattering spectroscopy. Ingenious experiments on molecular vibrational and rotational relaxation processes by means of light pulses in the picosecond range, as reported by J. A. Giordmaine (Bell Laboratories) and P. M. Rentzepis (Bell Laboratories), demonstrate techniques of great importance and sophistication for very fast relaxation processes.

Laser Raman spectroscopy was reviewed by S. P. S. Porto (University of Southern California). The advantages of laser over conventional light sources include its monochromaticity and power density. A renaissance in Raman spectroscopy is inevitable, since lasers enable us to study polarized Raman spectra as well as line shapes (R. Gordon, Harvard University; A. D. May, University of Toronto). C. K. N. Patel (Bell Laboratories) discussed the extension of visible laser spectroscopy to the infrared region by the use of CO_2 lasers and nonlinear optics.

J. B. Lastovka (M.I.T.) explained and compared the heterodyne and self-beating techniques in optical mixing spectroscopy. Spectrometers which incorporate features from radio-frequency and microwave spectroscopy have resolving powers of about 10^{14}, exceeding the best optical interferometers by a factor of at least 1 million. Such extremely high resolutions allow observations of small energy changes in the domain of thermal motions of molecules. The time-dependent behavior of collective systems can thus be measured and interpreted with Van Hove's time-dependent correlation functions. Applications include localized velocity of fluid flow, time-dependent fluctuations of density and concentration (G. B. Benedek, M.I.T.; B. Chu, State University of New York at Stony Brook) of systems near the critical point, and transport properties of macromolecules in solution (R. Pecora, Stanford University).

By utilizing relatively high-power densities of continuous wave helium-neon lasers, R. S. Stein (University of Massachusetts) was able to film time-dependent structural changes in stretching polyethylene films. Brillouin spectra of solids (H. Z. Cummins, Johns Hopkins University), liquids (T. A. Litovitz, Catholic University of America; D. P. Eastman, Pennsylvania State University), and gases (N. Ford, University of Massachusetts), as well as shear waves in liquids (B. P. Stoicheff, University of Toronto), demonstrate the tremendous potential of lasers for the study of photon-phonon interactions by means of inelastic light scattering. By the use of single-mode lasers, Fabry-Perot interferometers, and photon-counting techniques, Brillouin spectroscopy has overcome the major experimental difficulties and should flourish within the foreseeable future.

Using the hydrodynamic theory of light scattering from a chemically reactive fluid, Z. W. Salsburg (Rice University) showed the feasibility of measuring extremely fast reaction kinetics by means of laser scattering; this technique makes it possible to bridge relaxation-time capabilities from the ultrasonic range to the 10^{-13} second region in which inelastic scattering of slow neutrons occurs. This approach was demonstrated by a measurement of the relaxation times of hydration of zinc sulfate in aqueous solutions by Y. Yeh (Lawrence Radiation Laboratory, University of California, Livermore).

The final talk by P. A. Egelstaff (Harwell, England) emphasized the limitations of lasers as probes and stressed the advantages of combining laser scattering with neutron scattering, a technique still in its infancy. The delay is partly due to the need for nuclear reactors of very high flux as neutron sources, an investment which few countries can afford.

BEN CHU

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