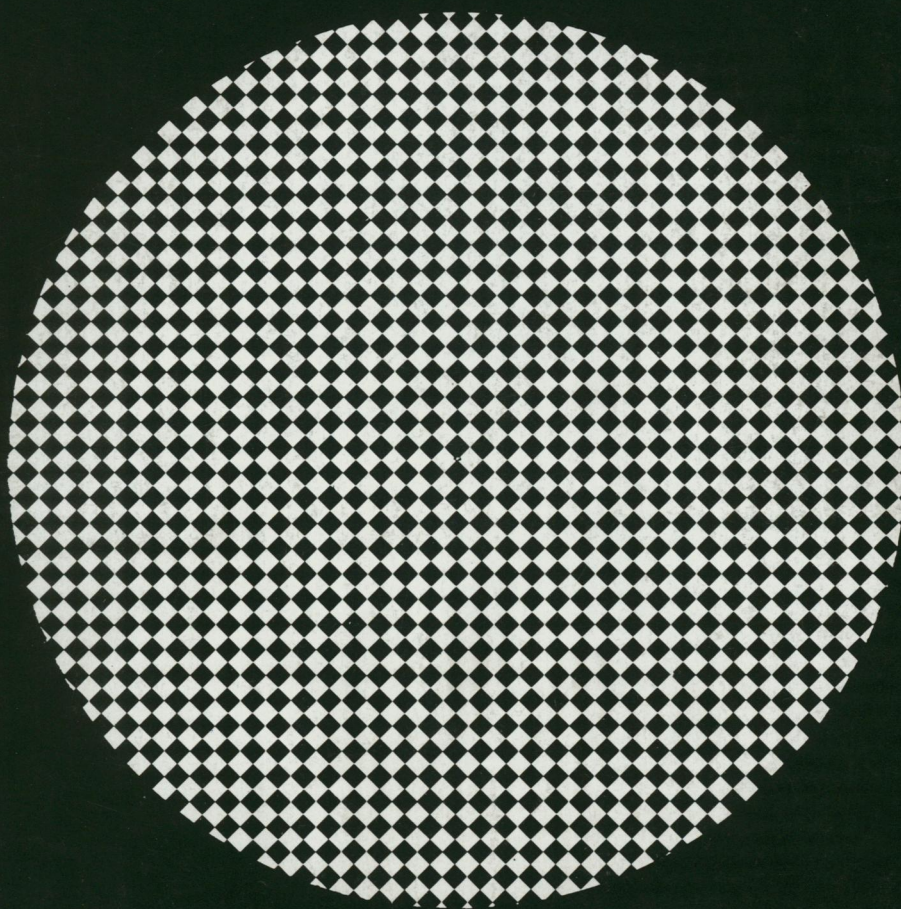
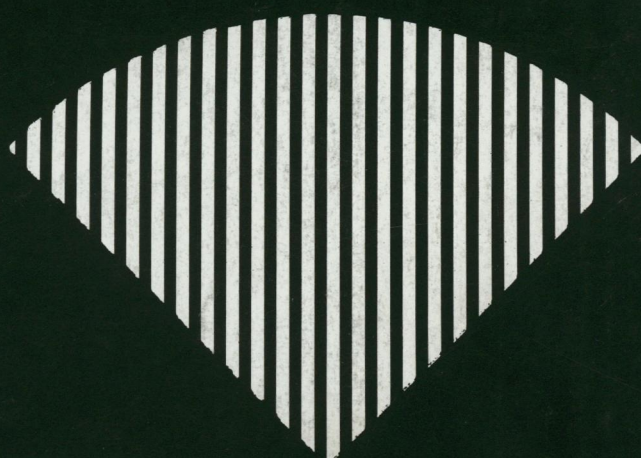
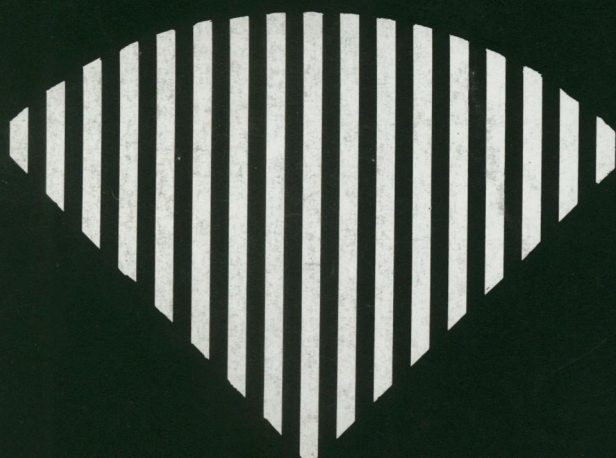


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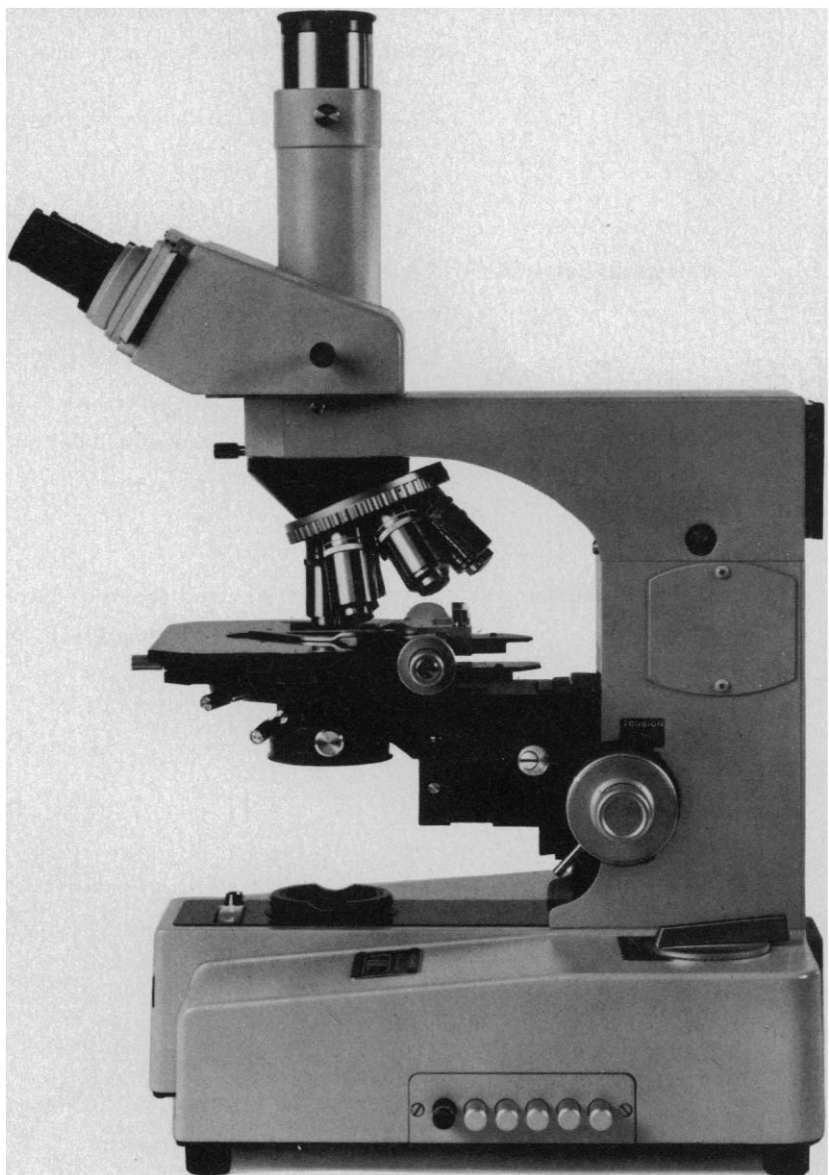
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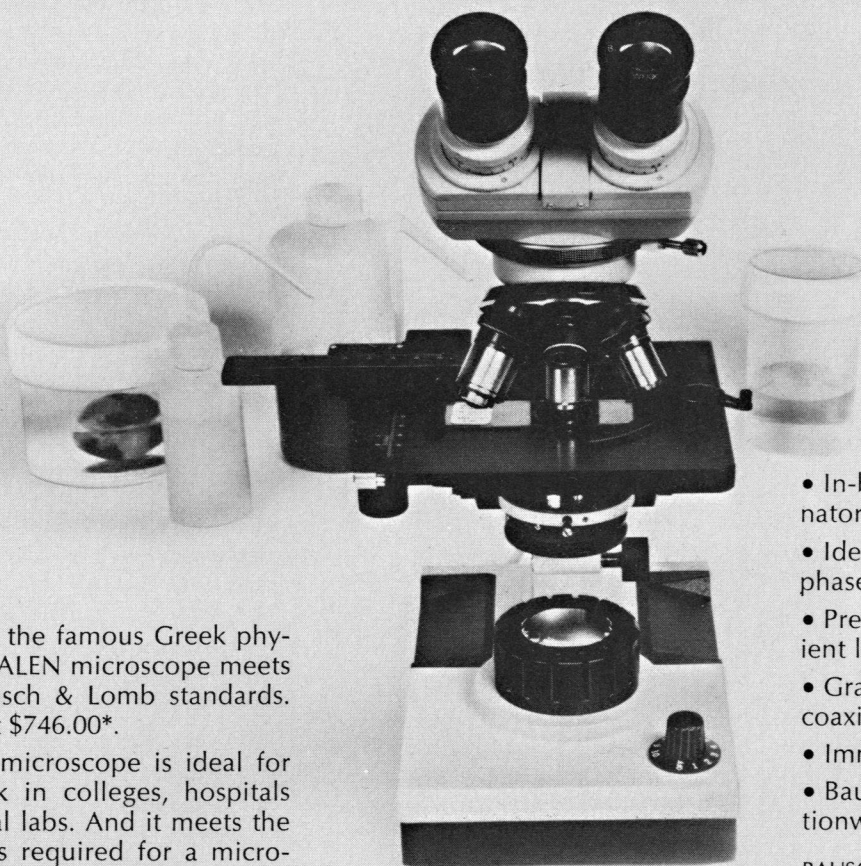
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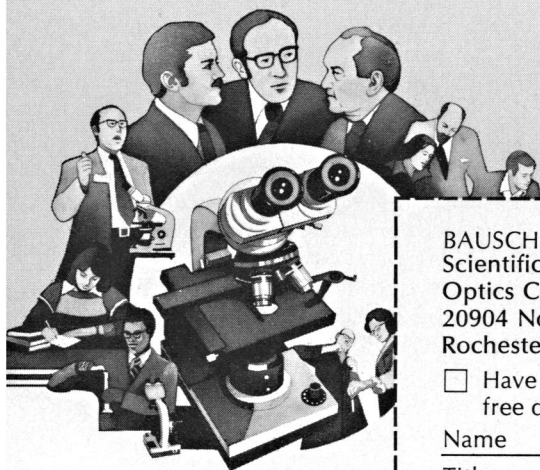
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LETTERS

Drug Shortages

The article "Penicillin G: Suddenly a shortage" by Barbara J. Culliton (News and Comment, 19 Mar., p.1157) accurately describes the shortage of intravenous penicillin G which has existed during the past few months. Shortages of other drugs (injectable local anesthetics, vasopressor agents, electrolyte additives, and so forth) have been occurring with increasing frequency during the past year, posing numerous problems, particularly in hospitals.

The American Society of Hospital Pharmacists and the Food and Drug Administration have jointly developed a nationwide Drug Shortage Monitoring Program which will be operational within the next few weeks. This program will enable us to anticipate drug supply problems and will provide information about their extent and expected duration. An important goal of the program is to help eliminate artificial shortages caused by rumor, such as the toilet tissue panic a year or so ago.

MICHAEL H. STOLAR

*American Society of Hospital
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Big University

The editorial "Big University—Humane or bureaucratic?" by Susan Arandi (19 Mar., p. 1129) is well stated and expresses what many of us have been thinking for some time. At the University of Florida, the change from an academic institution to a huge bureaucracy has occurred slowly, and only over the last several years has the faculty realized with horror what has occurred.

There are seven levels of administration over the professor in our state university system. The upper six levels are occupied by what I would term "professional administrators." That is, they are not associated to any extent with an academic discipline. This has led to cleavage of the academic community into administrators and faculty. The "Big University" should utilize the organization practiced by some of the better private universities: administration positions from department head to president should be filled by election or appointment from the senior faculty on a rotating basis. The highest academic rank in the university should be that of professor.

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As for the myriad of lower echelon administrative personnel, their cost should be reduced to no more than 10 percent of the operating budget. This could be done by the university's negotiating with the state and federal governments for some less demanding accounting system. Then we could do away with personnel departments, publicity bureaus, personnel evaluation forms, time cards—in fact most forms and more than three copies of anything.

KENNETH W. MCKERNS
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Aleut Life Expectancy

W. S. Laughlin's very interesting work with Soviet scientists on the ecology and archeology of the Aleutian peoples (15 Aug. 1975, p. 507) cites the population structure and processes of Aleut and Eskimo peoples as an expression of the ecological adaptation of the Aleuts. A closer look at the demographic data presented, however, raises some doubts about whether he has really established the theoretical points he makes.

Questions immediately arise when one notes that in Laughlin's figure 3, presenting life expectancy of males at age 15, 3 of the 12 columns of data are based on skeletons. Skeletons have an estimated age at death but obviously have no life expectancy, not simply because they are already dead but because life expectancy is a property of populations, not individuals. Three more columns are based on a census, a form of data from which one can derive life expectancy estimates only by making stringent and rather unlikely assumptions about the growth rate of the population and the constancy of past mortality (1). One column in figure 3, that labeled "Unalaska 1822," is noted in the text as being based on a population of 411 deaths from which a life table can readily be constructed. However, Laughlin gives no information about the size of the population from which these deaths were drawn and what proportion of all deaths during that period were recorded, no assurance that the extremely likely underrepresentation of infant deaths has been assessed or corrected, and no information on the crucial question of how the age of these people was estimated.

If the data in figure 3 represent the true expectation of life at age 15 for males, I

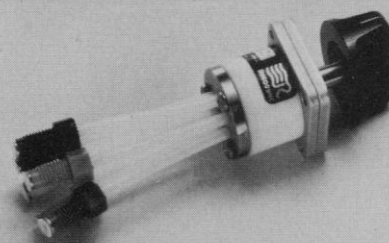
wouldn't necessarily describe this as an "Aleut achievement of longevity." The model life table for all human populations which gives an expectation of life at age 15 for males of 35 years (comparable to the Unalaska 1822 data) gives an expectation of life at birth of 30 years for women and 27.7 years for men, and nearly 45 percent of the babies born die before reaching the age of 15 (2). This is comparable to the results I have found for the hunting and gathering !Kung (3) people of the Kalahari desert and represents "a better management policy for natural resources" only in comparison to the Eskimos, who seem to have an expectation of life at birth well under 20 years—below the level of the "worst" model life table presented in the Coale-Demeny series (2).

When we go back to look at the three very different age distributions of Aleut and Eskimo populations shown in Laughlin's figure 2, more questions arise about whether the conclusions can be accepted. Cross-sectional age distributions, which provide valuable information for ecological studies about the "dependency" burden of youth and old age on adults, tell us much more about the growth rate of the population than about the longevity (4). Figure 2 cannot be an age distribution in percentages, as it is labeled, or it would be impossible to have 100 percent at age 0, 80 percent at age 10, and so forth; apparently it represents the percentage at each age and older. I suspect, although I can't be sure, that the data in segment A represent the survivorship curve (the l_x column) of the life table based on those 411 deaths discussed above. If the data in segments B and C are cumulative age distributions of living populations, they are not comparable to those in segment A. If, on the other hand, they too are survivorship curves, I would be surprised and impressed at the low level of survivorship. In the absence of clear labeling and a basis for age estimation, I am not inclined to believe it.

The demography of small populations of primitive people is a sufficiently new and difficult field that it will be necessary to spell out the basis for conclusions, including such items as the procedure of age estimation, the data base, and the exact analysis performed, for some time, until a standard methodology is established.

NANCY HOWELL
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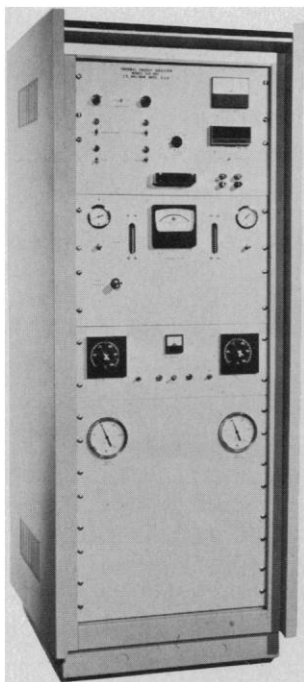
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References

1. U.N. Department of Economic and Social Affairs, *Manual IV: Methods of Estimating Basic Demographic Measures from Incomplete Data* (United Nations, New York, 1967).
2. A. J. Coale and P. Demeny, *Regional Model Life Tables and Stable Populations* (Princeton Univ. Press, Princeton, N.J., 1966).
3. N. Howell, in *Kalahari Hunter-Gatherers*, R. Lee and I. DeVore, Eds. (Harvard Univ. Press, Cambridge, Mass., in press).
4. A. J. Coale, *Milbank Mem. Fund Q.* **34** (No. 1), 79 (1956).

Human Vaginal Odors

The study by Doty *et al.* (Reports, 26 Dec. 1975, p. 1316) on human vaginal odors claims not to support "the notion that such odors are particularly attractive to humans in an in vitro test situation," since odors studied during all phases of the menstrual cycle showed mean estimates on the unpleasant side of the neutral zero point. The authors imply that the absence of pleasantness in the "out-of-context test situation" may be the result of cultural or learning factors, or the underdevelopment of man's olfactory system, or his lack of a functioning vomeronasal organ.

Although this research has an elegant methodology, and contextual factors are appreciated, it is inadequately conceptualized, since the investigators appear to tacitly assume that pleasantness of these odors is independent of the state of the judges. It is commonly experienced that a state of sexual excitement profoundly alters perception; for example, a tactile input which is painful in a state of sexual nonarousal may be quite pleasurable when experienced during a state of sexual arousal. Since the observers making judgments in Doty *et al.*'s experiment were apparently not sexually aroused, the authors' conclusion referred to above is hardly justified. This well illustrates that psychological science, however sophisticated, often requires grounding in the phenomenology of ordinary experience.

GORDON G. GLOBUS

HARRY B. COHEN

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We reported that the general absence of pleasantness responses to human vaginal odors in our particular out-of-context in vitro test situation may be the result of cultural or learning factors or man's comparatively undeveloped olfactory system or his lack of a functioning vomeronasal organ. We did not suggest, as Globus and Cohen "appear to tacitly assume,"

that such odors in other contexts would be perceived similarly, or that the factors mentioned by Globus and Cohen were the only ones potentially involved in producing our effects. The opinion of Globus and Cohen that hedonic responses to vaginal odors change as a function of sexual arousal provides an interesting hypothesis for future research. Unfortunately, no experimental data exist on this point, making their opinion pure conjecture at the present time. Examples of changes in another, quite different, sensory modality during sexual arousal cannot be taken as strong support for the efficacy of such a notion.

A sampling of a number of individuals' opinions (including our own) regarding the perceived pleasantness of vaginal odors in heterosexual contexts suggests a wide variety of experiences, presumably depending upon factors such as the partners involved, their ages, sexual proclivities, histories, and a host of situational variables. The salience of odor memory (1) and the close relationship of the chemical senses to emotional processes suggest the possibility of various types of odor conditioning occurring in human sexual situations. Aversions to vaginal secretions can be produced quite easily in hamsters (a species whose vaginal secretions appear to be sexually attractive to conspecific males) by pairing ingestion of the secretion with gastrointestinal illness (2).

As we are the first to admit, a study such as ours has many inherent limitations, particularly in the eyes (or noses) of readers who wish to generalize its findings to coital situations. We hope that our experiment and the opinions of Globus and Cohen will entice scientists specifically interested in the perception of vaginal odors in coital situations to perform in vivo experiments on this topic. We hope such individuals will use a variety of participants so as not to bias their findings with too small a sample of the frequently misleading "phenomenology of ordinary experience."

RICHARD L. DOTY

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References

1. H. T. Lawless and W. B. Cain, *Chem. Senses Flavor* **1**, 331 (1975).
2. R. E. Johnston and D. M. Zahorik, *Science* **189**, 891 (1975).

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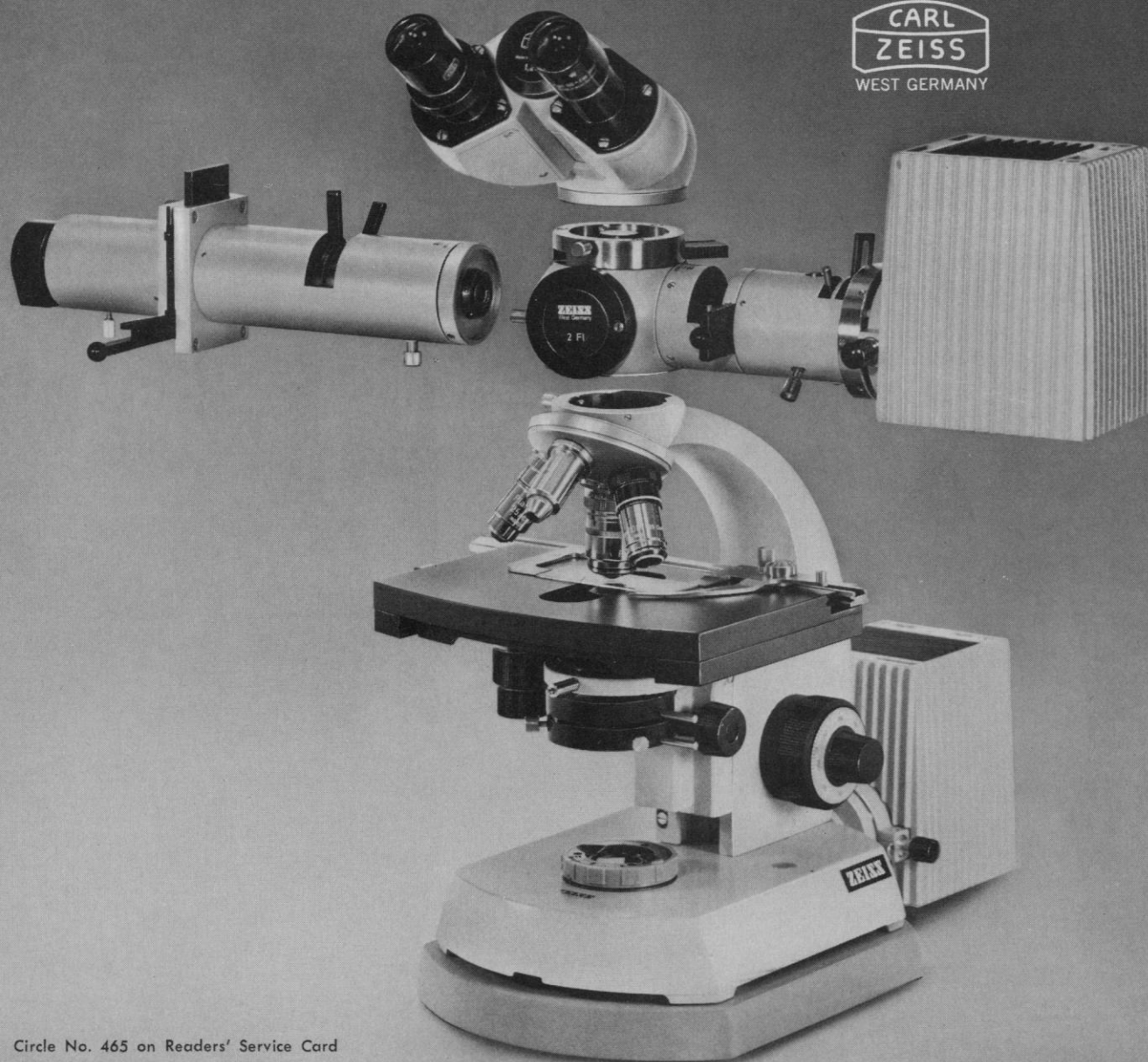
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Scientific Quests and Governmental Principles

Basic science is now on the defensive. It is being assailed by groups and governments as being costly and dangerous, as being silly or ominous. Now that modern biology, for example, has achieved some mastery over genetics, various scenarios of deliberate intrusion into the human gene pool are being rehearsed, almost always with more anxiety than insight. These fears reflect our society's failure to understand the fundamental process of basic research and its relation to our historical and legal heritage. As a result of this failure, the ever-growing influence of scientific invention and technology has terrified us as much as it has given us peace.

In no age of Western history has a philosophical procedure been so tacitly accepted and used without understanding as has science by modern governments. I believe this is so because the people who govern are no longer in a sensible position to make wise decisions based on the advice of a Mandarin bureaucracy of scientific specialists. Our legislators are in that predicament because their present education and legal discipline simply exclude any understanding of the procedures and disciplines of scientific research. This is true for three reasons. First, science is not so complicated as it is abstract and far removed from ordinary sensory experience. Like the law, it requires discipline and training to become familiar with its abstractions. Second, only recently have historians and sociologists of science begun to show us the difference between the generative or creative aspects of science and its formulation and application in teaching. In the ignorance of their findings, science is usually experienced as a dead collection of facts rather than a characteristically human cultural activity. And third, legal precedent, which is the pillar of Anglo-Saxon law, has so far largely failed to incorporate the changes brought about by the impact of new scientific knowledge upon our lives and societies.

We have not two cultures, but two disciplines, the politico-legal and the scientific, and they very rarely intersect. Because of this, we are faced with two extreme ideological positions—scientism and anti-scientism. Both are dangerous as well as erroneous. Such ideological conflicts can be understood historically, but in order to understand their true basis and fully resolve them, we must understand how the brain itself produces thought and language. In our search for new knowledge, we have not yet fully committed ourselves to take on this most challenging and important task. When we know better how the brain works, I believe that we will better understand the relationship between scientific facts and those facts and ideologies that are not susceptible to verification in a laboratory.

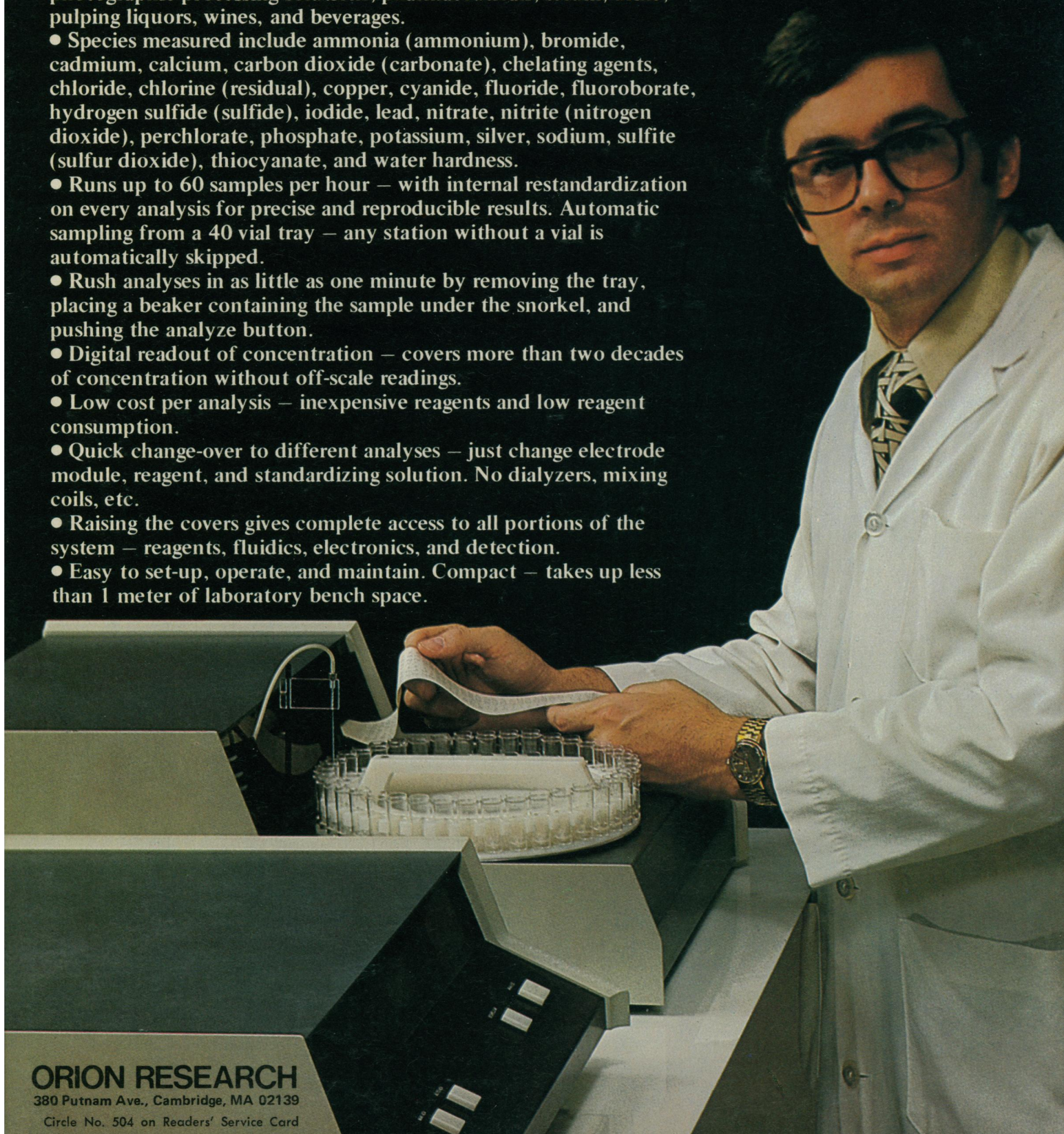
Until we have some scientific comprehension of the basis of knowledge itself, how can we deal with the difficulties posed by the separate customs of the disciplines of science and the disciplines of government? The main problem is how to encourage a higher level of understanding by scientists and lawyers of each others' discipline. There are short-range and long-range approaches to this problem. The short-range approach is one of testimony. Some have suggested that adversary proceedings are the only way in which scientific issues bearing upon society can be democratically handled. The essential difficulty is to decide who shall conduct such proceedings—the scientists or the lawyers. Resolution of this difficulty can only come by testing various alternatives in real situations.

The long-range and more substantial approach is to revamp our educational systems in law and science to provide a wider view of the fundamental questions in each discipline and to deepen the understanding of both the limits and the powers of their particular procedures. For now, we must continue to find ways to mix at least some legislators into our scientific brew (not to give us grants but to share our excitement) and to persuade more scientists to join the polity not as advisers but in political roles themselves.—GERALD M. EDELMAN, *The Rockefeller University, New York*

This editorial is adapted from a paper presented at the symposium, "Beyond Tomorrow: Trends and Prospects in Medical Science," held at The Rockefeller University, 8 March 1976.

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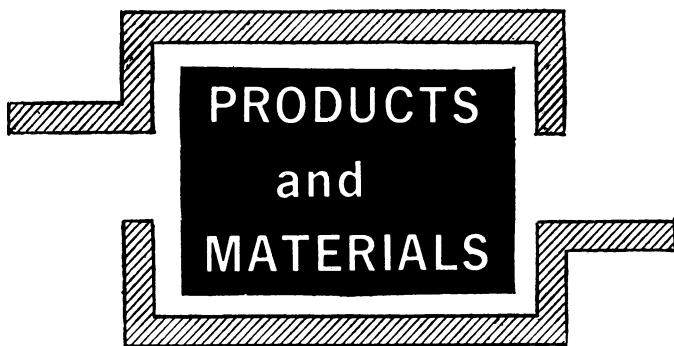
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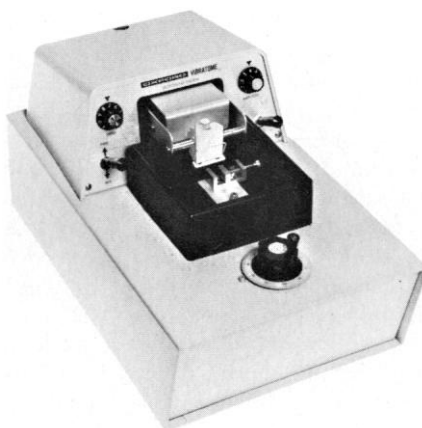


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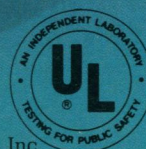
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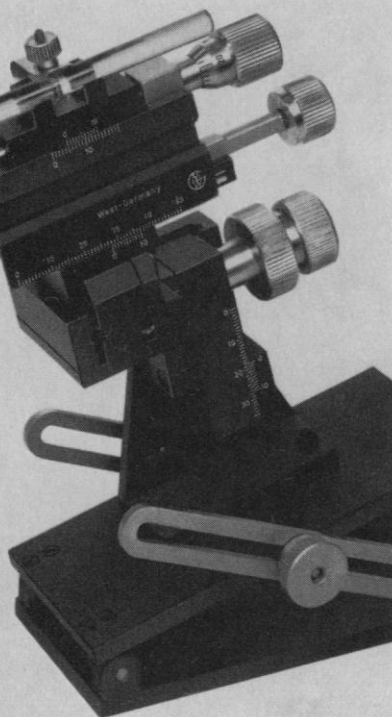
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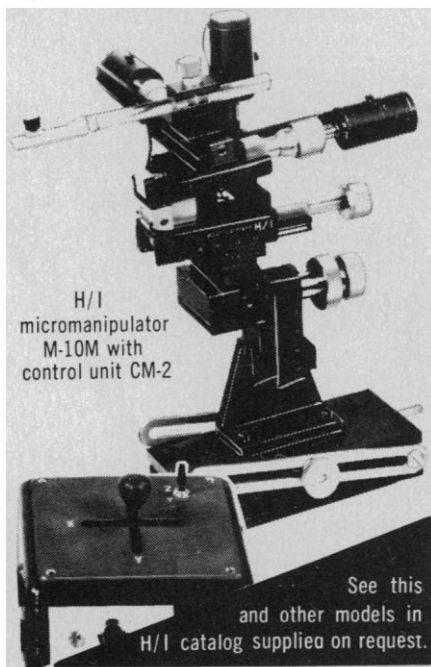
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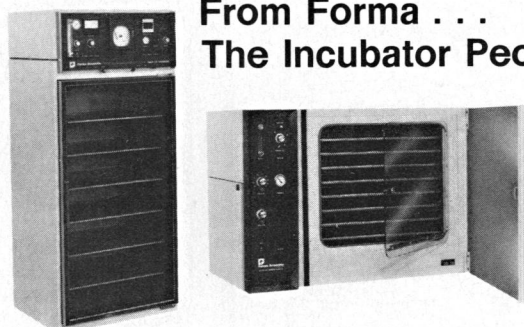
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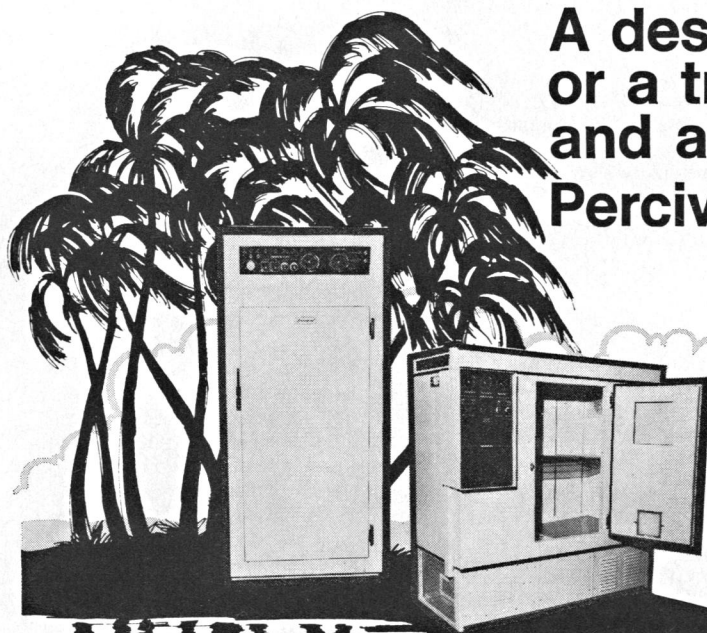
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The Lytic Compartment of Plant Cells. Ph. Matile. Springer-Verlag, New York, 1975. xiv, 184 pp., illus. \$38.30. Cell Biology Monographs, vol. 1.

The Manpower Connection. Education and Work. Eli Ginzberg. Harvard University Press, Cambridge, Mass., 1975. xii, 258 pp. \$15.

Manual of Endocrine Surgery. Anthony J. Edis, Luis A. Ayala, and Richard H. Egdahl. Springer-Verlag, New York, 1975. xiv, 274 pp., illus. \$38.50. Comprehensive Manuals of Surgical Specialties.

Marine Chemistry in the Coastal Environment. Papers from a symposium, Philadelphia, Apr. 1975. Thomas M. Church. Ed. American Chemical Society, Washington, D.C., 1975. x, 710 pp., illus. \$35.75. ACS Symposium Series 18.

The Measurement of Airborne Particles. Richard D. Cadle. Wiley-Interscience, New York, 1975. xiv, 342 pp., illus. \$22.50. Environmental Science and Technology.

The Measurement of Appearance. Richard S. Hunter. Wiley-Interscience, New York, 1975. xvi, 348 pp., illus. \$19.50.

The Mentally Retarded and Society. A Social Science Perspective. Proceedings of a conference, Niles, Mich., Apr. 1974. Michael J. Begab and Stephen A. Richardson, Eds. University Park Press, Baltimore, 1975. xx, 492 pp. \$17.50.

Methanation of Synthesis Gas. Papers from a symposium, Atlantic City, N.J., Sept. 1974. Len Seglin, Ed. American Chemical Society, Washington, D.C., 1975. xii, 178 pp., illus. \$19.75. Advances in Chemistry Series, 146.

Methods in Cell Biology. Vol 12, Yeast Cells. David M. Prescott, Ed. Academic Press, New York, 1975. xvi, 396 pp., illus. \$28.

Methods of Surface Analysis. A. W. Czanderna, Ed. Elsevier, New York, 1975. xiv, 482 pp., illus. \$62.50. Methods and Phenomena, vol. 1.

Microbial Interaction with the Physical Environment. D. W. Thayer, Ed. Dowden, Hutchinson and Ross, Stroudsburg, Pa., 1975 (distributor, Halsted [Wiley], New York). xvi, 432 pp., illus. \$27. Benchmark Papers in Microbiology, vol. 9.

Microneurosurgery. Papers from a symposium, Kyoto, Japan, Oct. 1973. Hajime Handa, Ed. University Park Press, Baltimore, and Igaku Shoin, Tokyo, 1975. xx, 202 pp., illus. \$39.50.

Microscopy of Materials. Modern Imaging Methods Using Electron, X-Ray and Ion Beams. D. K. Bowen and C. R. Hall. Halsted (Wiley), New York, 1975. x, 304 pp., illus. \$27.50.

Military Strategy and Tactics. Computer Modeling of Land War Problems. Proceedings of a conference, Ottobrunn, Germany, Aug. 1974. Reiner K. Huber, Lynn F. Jones, and Egil Reine, Eds. Plenum, New York, 1975. x, 368 pp., illus. \$32.50.

Modern Introduction to Classical Mechanics and Control. David N. Burghes and Angela M. Downs. Horwood, Chichester, England, and Halsted (Wiley), New York, 1975. x, 320 pp., illus. \$18.50. Mathematics and Its Applications.

Morphogenesis of Skin. Philippe Sengel. Cambridge University Press, New York, 1976. viii, 278 pp., illus. \$37. Developmental and Cell Biology Series, 3.

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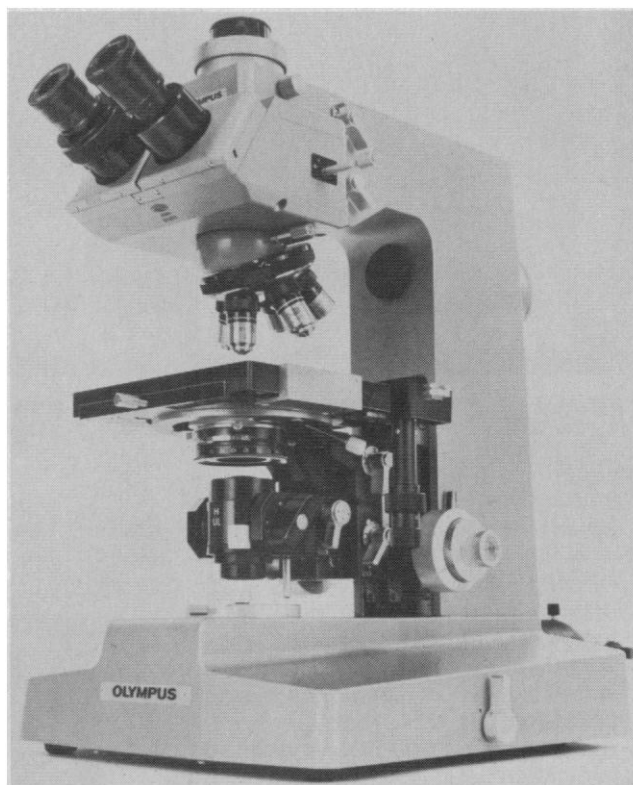
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Mouse Hepatic Neoplasia. Proceedings of a workshop, High Wycombe, England, May 1974. W. H. Butler and P. M. Newberne, Eds. Elsevier, New York, 1975. xii, 196 pp., illus. \$31.25.

Natural Resources and Public Relations. Douglas L. Gilbert. Wildlife Society, Washington, D.C., ed. 2, 1975. xxiv, 320 pp., illus. \$6.50.

Neurobiology of Aging. An Interdisciplinary Life-Span Approach. J. M. Ord and K. R. Brizzee, Eds. Plenum, New York, 1975. x, 604 pp., illus. \$32.50. *Advances in Behavioral Biology*, vol. 16.

The New Oxford Atlas. Prepared by the Cartographic Department of the Oxford Uni-

versity Press. Oxford University Press, New York, 1975. 202 pp. \$19.95.

1976 Yearbook of Astronomy. Patrick Moore, Ed. Sidgwick and Jackson, London, and Norton, New York, 1976. 216 pp., illus. \$9.95.

Nonparametrics. Statistical Methods Based on Ranks. E. L. Lehmann with the assistance of H. J. M. D'Abrera. Holden-Day, San Francisco, and McGraw-Hill, New York, 1975. xvi, 458 pp. \$22.95. Holden-Day Series in Probability and Statistics.

Nuclear Reactor Analysis. James J. Duderstadt and Louis J. Hamilton. Wiley, New York, 1976. xx, 650 pp., illus. \$23.95.

Nuclear Structure. Vol. 2, Nuclear Deformations.

Aage Bohr and Ben R. Mottelson. Benjamin, Reading, Mass., 1975. xviii, 748 pp., illus. \$37.50.

The Observation and Analysis of Stellar Photospheres. David F. Gray. Wiley-Interscience, New York, 1976. xvi, 472 pp., illus. \$24.95.

Optical Properties of Highly Transparent Solids. Proceedings of a conference, Waterville Valley, N.H., Feb. 1975. Shashanka S. Mitra and Bernard Bendow, Eds. Plenum, New York, 1975. xx, 538 pp., illus. \$39.50. *Optical Physics and Engineering*.

The Origins of Digital Computers. Selected Papers. Brian Randell. Springer-Verlag, New York, ed. 2, 1975. xvi, 464 pp., illus. \$14.90. *Texts and Monographs in Computer Science*.

Pathogenic and Non-Pathogenic Amoebae. B. N. Singh. Halsted (Wiley), New York, 1975. x, 236 pp., illus. \$42.50.

Pharmacists for the Future. The Report of the Study Commission on Pharmacy. Health Administration Press, Ann Arbor, Mich., 1975. xii, 164 pp. Paper, \$6.

Philosophers and Machines. Otto Mayr, Ed. Science History Publications (Neale Watson), New York, 1976. viii, 194 pp., illus. Cloth, \$9.95; paper, \$4.75. *History of Science Selections from Isis*.

Phloem Transport. Papers from a NATO Advanced Study Institute, Banff, Alberta, Canada, Aug. 1974. S. Arnoff, J. Dainty, P. R. Gorham, L. M. Srivastava, and C. A. Swanson, Eds. Plenum, New York, 1975. x, 626 pp., illus. \$48. NATO Advanced Study Institutes Series A, vol. 4.

Photoelectron and Auger Spectroscopy. Thomas A. Carlson. Plenum, New York, 1975. xiv, 418 pp., illus. \$32.50. *Modern Analytical Chemistry*.

Photographic Processing Chemistry. L. F. A. Mason. Halsted (Wiley), New York, ed. 2, 1975. 326 pp., illus. \$27.50.

Physical Properties of Textile Fibres. W. E. Morton and J. W. S. Hearle. Halsted (Wiley), New York, ed. 2, 1975. xviii, 660 pp., illus. \$49.50.

Physics of High-Temperature Reactors. Luigi Massimo. Pergamon, New York, 1976. xxiv, 220 pp., illus. \$20.

Physiological and Biochemical Aspects of Heavy Elements in Our Environment. Proceedings of a symposium, Utrecht, May 1974. J. P. W. Houtman and C. J. A. van den Hamer, Eds. Delft University Press, Delft, the Netherlands, 1975 (distributor, Academic Book Services, Holland, Groningen). x, 78 pp., illus. Paper, Dfl. 35.

Pioneers in Neuroendocrinology. Joseph Meites, Bernard T. Donovan, and Samuel M. McCann, Eds. Plenum, New York, 1975. viii, 328 pp., illus. \$22.50. *Perspectives in Neuroendocrine Research*, vol. 1.

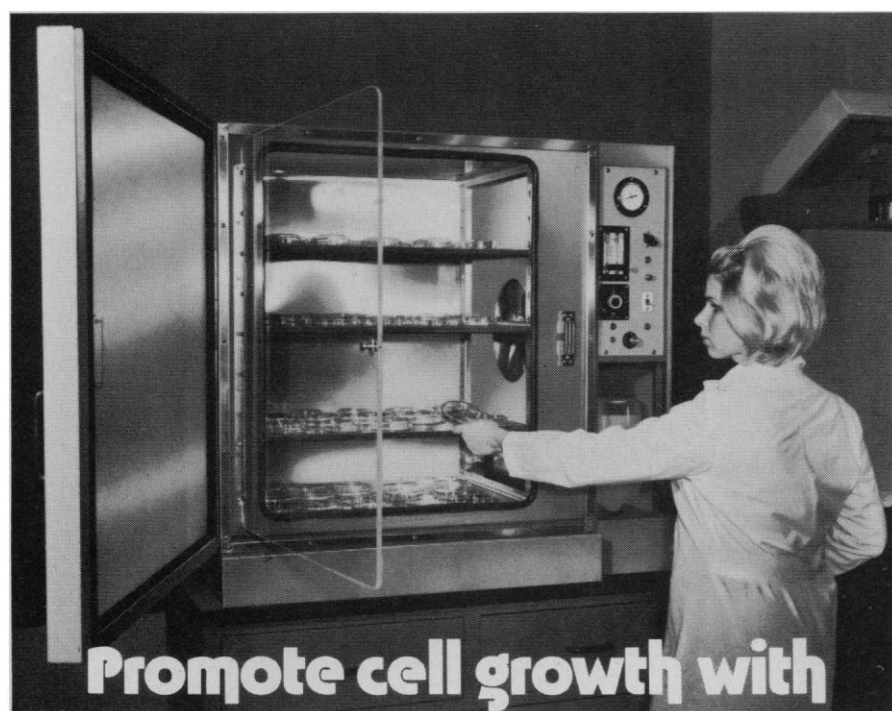
Plant Chromosomes. Askell Löve and Doris Löve. Cramer (Gantner), Vaduz, Liechtenstein, 1975 (U.S. distributor, International Scholarly Book Services, Portland, Ore.). xvi, 184 pp., illus. \$15. *Plant Science* 1.

Plants in Saline Environments. A. Poljakoff-Mayber and J. Gale, Eds. Springer-Verlag, New York, 1975. viii, 216 pp., illus. \$31.30. *Ecological Studies*, vol. 15.

Plants, Man and the Land in the Vilcanota Valley of Peru. Daniel W. Gade. Junk, The Hague, 1975. viii, 240 pp., illus. Dfl. 70. *Biogeographica*, vol. 6.

Practical Heat Recovery. John L. Boyen. Wiley-Interscience, New York, 1975. xii, 254 pp., illus. \$16.95.

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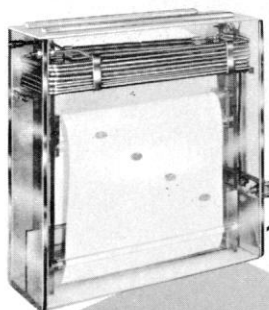
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ings of a symposium, Princeton, N.J., June 1974. Abraham Sudilovsky, Samuel Gershon, and Bernard Beer, Eds. Raven, New York, 1975. xii, 304 pp., illus. \$22.50.

Primary Productivity of the Biosphere. Helmut Lieth and Robert H. Whittaker, Eds. Springer-Verlag, New York, 1975. viii, 340 pp., illus. \$29.80. Ecological Studies, vol. 14.

Probability; Decision; Statistics. James V. Bradley. Prentice-Hall, Englewood Cliffs, N.J., 1976. xviii, 586 pp., illus. \$18.50. (Errata sheet available from the author, Department of Psychology, New Mexico State University, Las Cruces.)

Problems in Quantum Mechanics. E. ter Haar, Ed. Pion, London, ed. 3, 1975 (distributor, Academic Press, New York). viii, 468 pp. \$19.50.

Processus Aléatoires. Utilisés en Recherche Opérationnelle. D. Carton. Masson, Paris, 1975. x, 150 pp. Paper. 38 F. Statistique et Décisions Economiques.

Prostaglandin Abstracts. A Guide to the Literature. Vol. 2, 1971-1973. Ronald A. Shalita. IFL/Plenum, New York, 1975. xii, 452 pp. \$39.50.

Psychopharmacogenetics. Basil E. Eleftheriou, Ed. Plenum, New York, 1975. viii, 472 pp., illus. \$28.

Pulsating Stars. B. V. Kukarkin, Ed. Translated from the Russian edition (Moscow, 1970) by R. Hardin. Halsted (Wiley), New York, and Israel Program for Scientific Translations, Jerusalem, 1975. xvi, 320 pp., illus. \$37.50. IPST Astrophysics Library.

Pursuit Games. An Introduction to the Theory and Applications of Differential Games of Pursuit and Evasion. Otomar Hájek. Academic Press, New York, 1975. xii, 266 pp., illus. \$10.50. Mathematics in Science and Engineering, vol. 120.

Radiation Damage Processes in Materials. Proceedings of a NATO Advanced Study Institute, Corsica, France, Aug. 1973. C. H. S. Dupuy, Ed. Noordhoff, Leyden, the Netherlands, 1975 (U.S. distributor, Noordhoff International, 198 Ash St., Reading, Mass.). viii, 534 pp., illus. \$45.75. NATO Advanced Study Institutes Series E, No. 8.

Radiochemical Methods in Analysis. D. I. Coomber, Ed. Plenum, New York, 1975. x, 498 pp., illus. \$27.50.

Radioimmunoassay in Clinical Biochemistry. Papers from a symposium, Oxford, England, Sept. 1974. C. A. Pasternak, Ed. Heyden, London, 1975. xviii, 300 pp., illus. \$29.50.

La Réaction Métabolique. Jacques-A. Bègue and Max-Fernand Jayle. Presses Universitaires de France, Paris, 1975. 126 pp., illus. Paper, 6.50 F. "Que Sais-Je?" No. 1578.

Reactive Intermediates in Organic Chemistry. N. S. Isaacs. Wiley, New York, 1975. xiv, 550 pp., illus. Paper, \$12.50. Reprint of the 1974 edition.

Recent Topics in Chemical Carcinogenesis. In Memory of Professor Tomizo Yoshida. Shigeyoshi Odashima, Shozo Takayama, and Haruo Sato, Eds. University Park Press, Baltimore, 1975. xxvi, 456 pp., illus. \$44.50. Japanese Cancer Association GANN Monographs on Cancer Research, No. 17.

Refined Carbohydrate Foods and Disease. Some Implications of Dietary Fibre. D. P. Burkitt and H. C. Trowell, Eds. Academic Press, New York, 1975. xiv, 356 pp., illus. \$19.25.

The Role of Fats in Human Nutrition. A. J. Vergroesen, Ed. Academic Press, New York, 1975. xiv, 494 pp., illus. \$36.25

The Satellite Spin-Off. The Achievements of

Space Flight. Günter Paul. Translated from the German edition by Alan and Barbara Lacy. Luce, Washington, D.C., 1975 (distributor, McKay, New York). 272 pp., illus. \$10.

The Sciences, the Humanities and the Technological Threat. W. Roy Niblett, Ed. Halsted (Wiley), New York, 1975. xiv, 168 pp. \$12.50.

Sea Shells of the West Indies. A Guide to the Marine Molluscs of the Caribbean. Michael Humfrey. Taplinger, New York, 1975. 352 pp., illus. \$19.95.

Shape Memory Effects in Alloys. Proceedings of a symposium, Toronto, May 1975. Jeff Perkins, Ed. Plenum, New York, 1975. x, 584 pp., illus. \$49.50. The Metallurgical Society of AIME Proceedings.

Soil Science and Archaeology. Susan Limbrey. Academic Press, New York, 1975. xvi, 384 pp., illus. \$21.75. Studies in Archaeological Science.

Some Unusual Engines. L. J. K. Setright. Illustrations selected by Michael Worthington-Williams. Published for the Institution of Mechanical Engineers by Mechanical Engineering, New York, 1975. x, 138 pp., illus. \$13.50.

Sound Reception in Mammals. Proceedings of a symposium, London, Mar. 1974. R. J. Bench, Ade Pye, and J. D. Pye, Eds. Published for the Zoological Society of London by Academic Press, New York, 1975. xviii, 358 pp., illus. \$25.56. Symposia of the Zoological Society of London, No. 37.

Statistical Mechanics and Its Chemical Applications. M. H. Everdell. Academic Press, New York, 1975. xxii, 306 pp., illus. \$22.75.

Statistical Methods for Engineers and Scientists. Robert M. Bethea, Benjamin S. Duran, and Thomas L. Boullion. Dekker, New York, 1975. xxii, 584 pp. \$25.50. Statistics, vol. 15.

Suicide in Different Cultures. Norman L. Farberow, Ed. University Park Press, Baltimore, 1975. xviii, 286 pp. \$19.50.

Surface Physics of Phosphors and Semiconductors. C. G. Scott and C. E. Reed, Eds. Academic Press, New York, 1975. xiv, 644 pp., illus. \$48.75.

Surveying for Field Scientists. J. C. Pugh. University of Pittsburgh Press, Pittsburgh, 1975. xxii, 230 pp., illus. Paper, \$13.95.

Swimming and Flying in Nature. Vol. 1. Proceedings of a symposium, Pasadena, Calif., July 1974. Theodore Y.-T. Wu, Charles J. Brokaw, and Christopher Brennan, Eds. Plenum, New York, 1975. xxii, 422 pp., illus. \$39.50.

A Synopsis of North American Desmids. Part 2, Desmidiaceae: Placodermata. Section 1. G. W. Prescott, Hannah T. Croasdale, and W. C. Vinyard. University of Nebraska Press, Lincoln, 1975. x, 276 pp., illus. \$20.

Theoretical Chemistry. Advances and Perspectives. Vol. 1. Henry Eyring and Douglas Henderson, Eds. Academic Press, New York, 1975. x, 224 pp., illus. \$19.50.

Thyroid Hormones. Biosynthesis, Physiological Effects, and Mechanisms of Action. Ya. Kh. Turakulov and six others. Ya. Kh. Turakulov, Ed. Translated from the Russian edition (Tashkent, 1972) by Basil Haigh. Donald H. Ford, Transl. Ed. Consultants Bureau (Plenum), New York, 1975. xii, 318 pp., illus. \$42.50. Studies in Soviet Science.

Unifying Concepts in Ecology. Papers from a congress, The Hague, Sept. 1974. W. H. van Dobben and R. H. Lowe-McConnell, Eds. Centre for Agricultural Publishing and Documentation, Wageningen, Netherlands, and Junk, The Hague, 1975. 302 pp., illus. Dfl. 75.