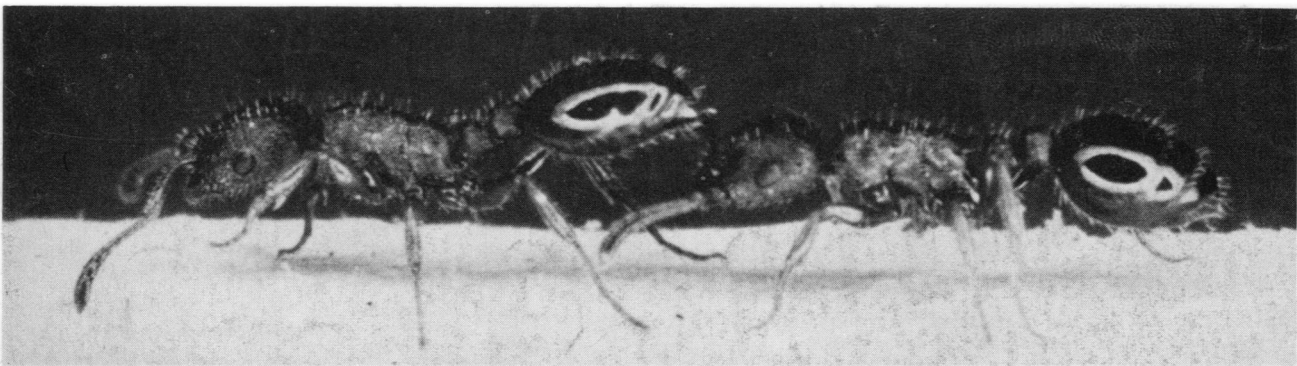
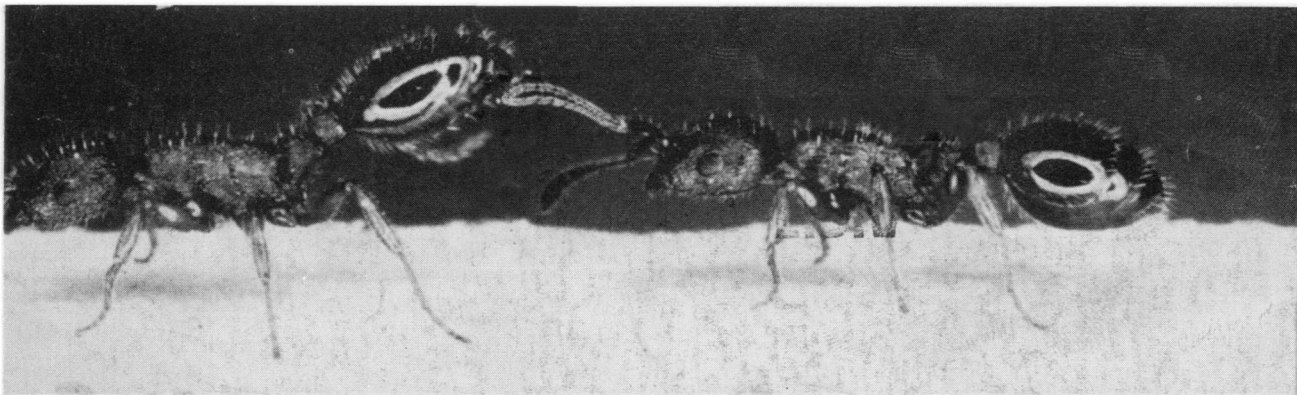
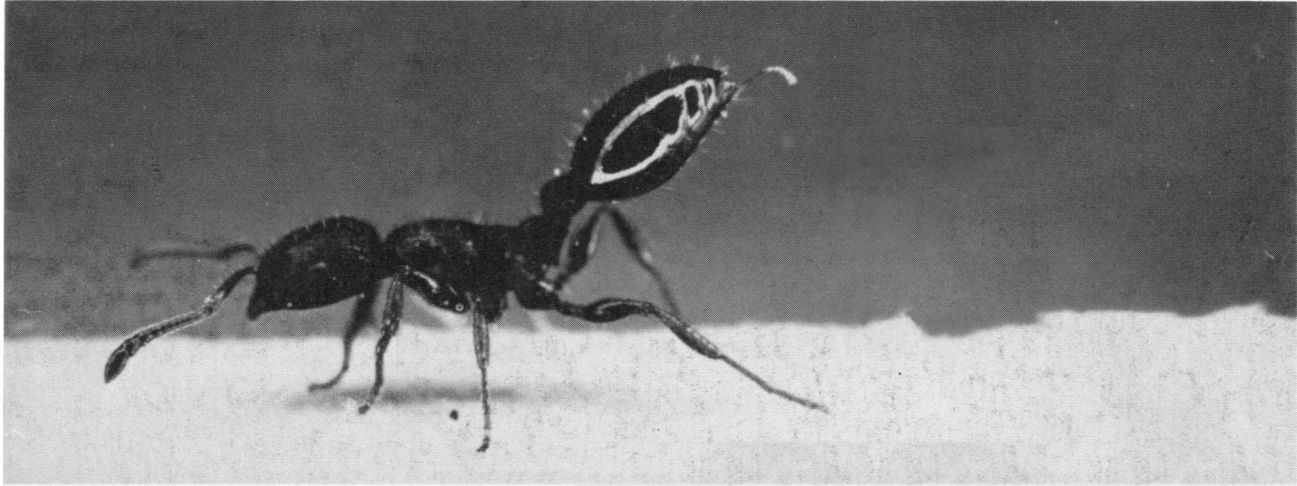


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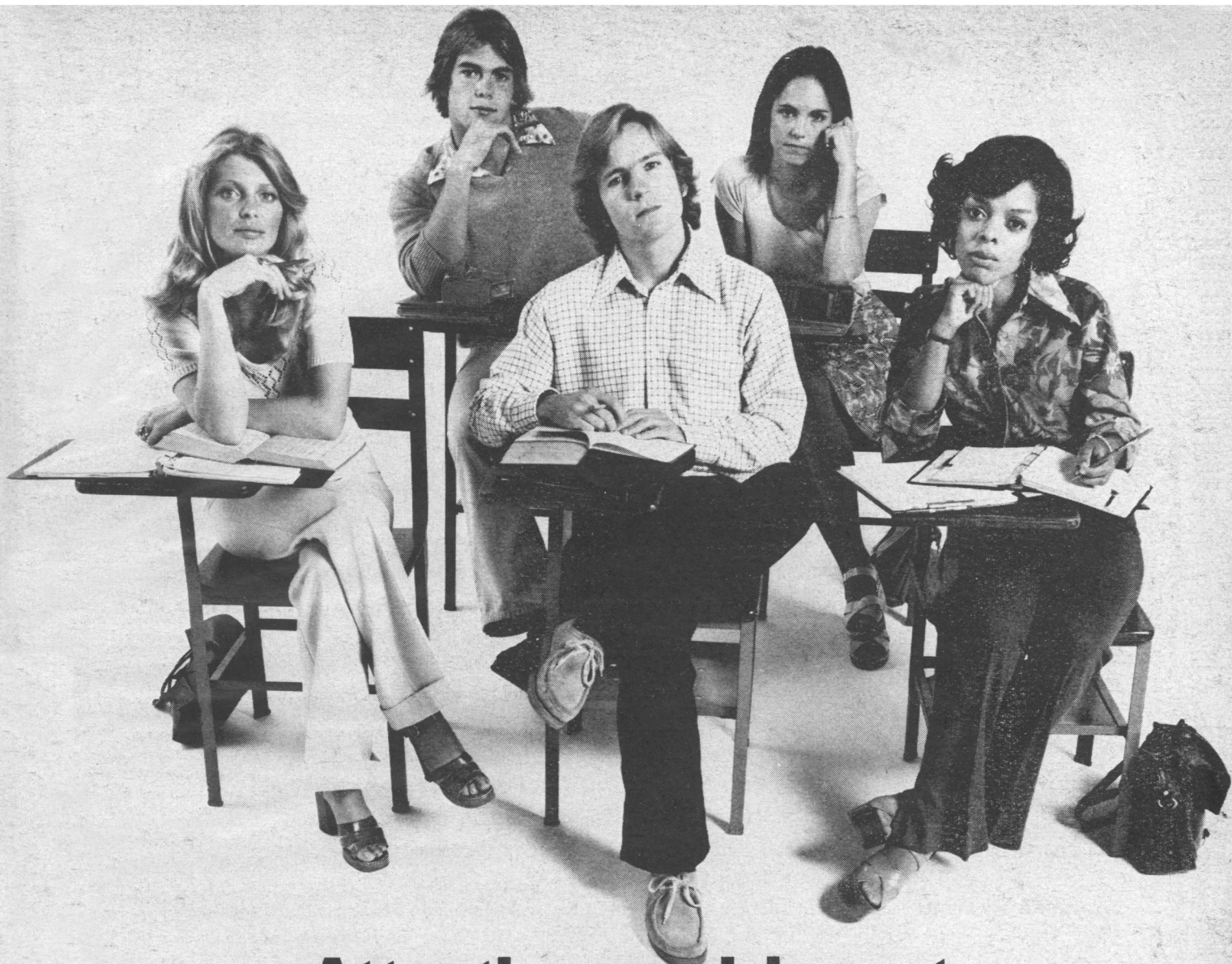
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Tandem running of ant (*Leptothorax acervorum*). (Top to bottom) Recruiting worker assumes calling position; nestmate arrives and touches the gaster and hindlegs of the calling ant with its antennae; and calling ant lowers its gaster and tandem running starts. The sting of the recruiting ant remains extruded, but it is not dragged over the surface. See page 1046. [Michael Möglich, Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts]

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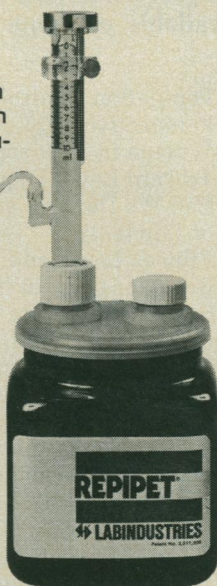
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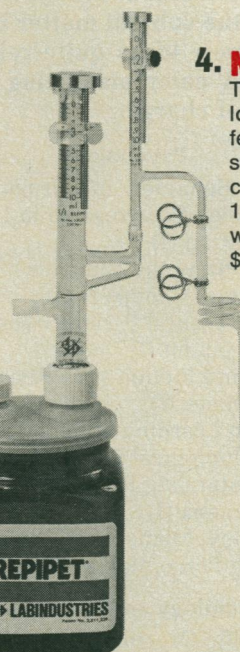
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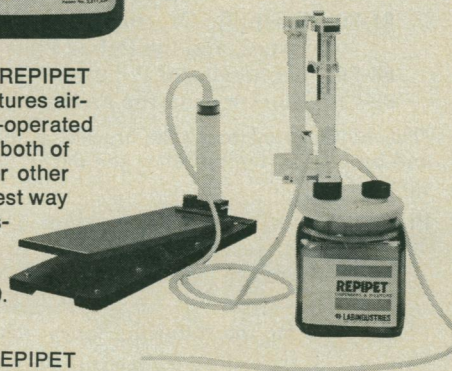
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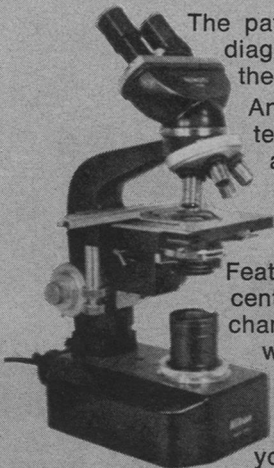
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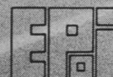
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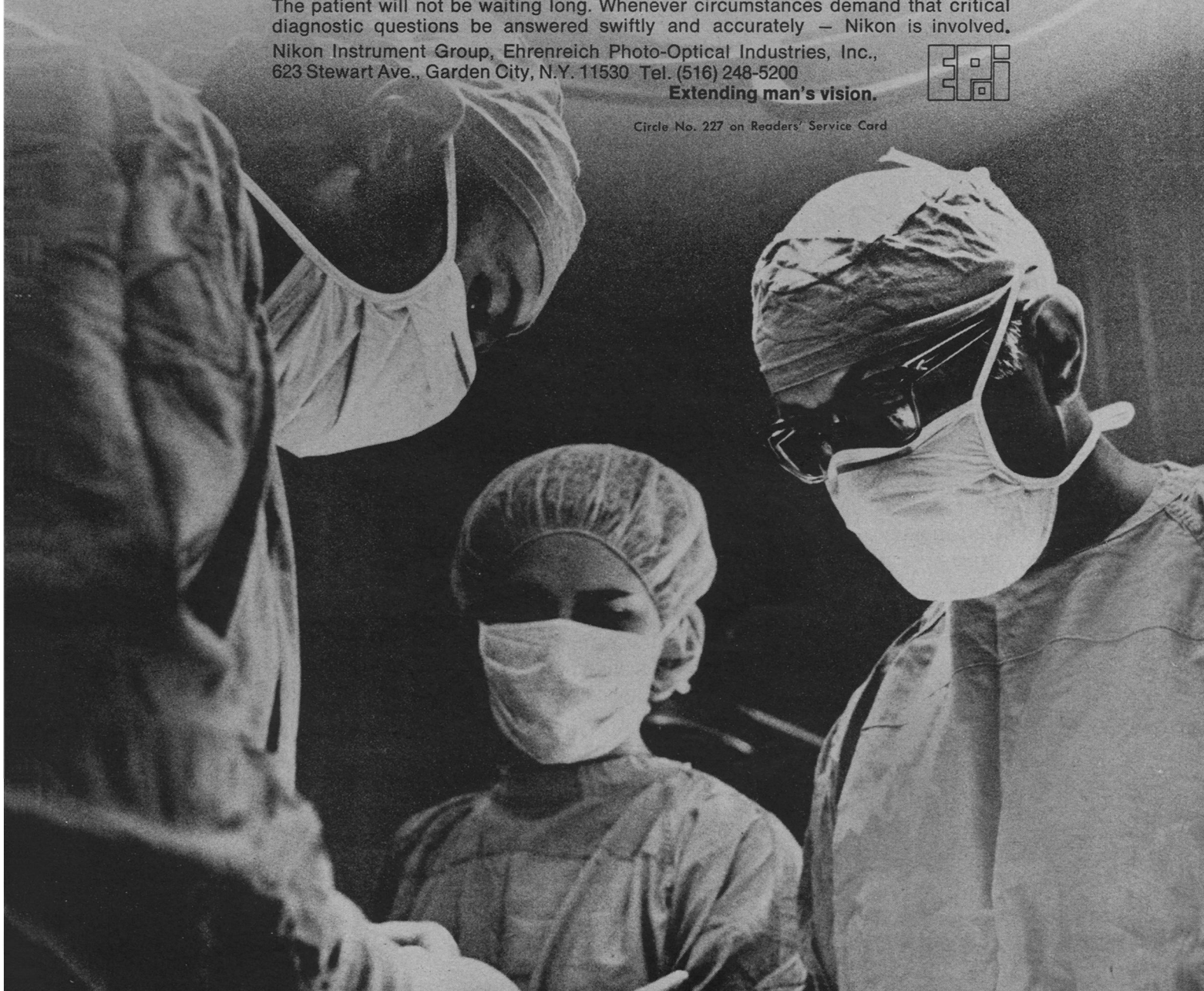
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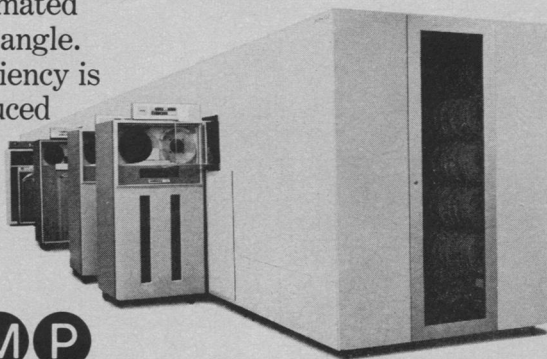
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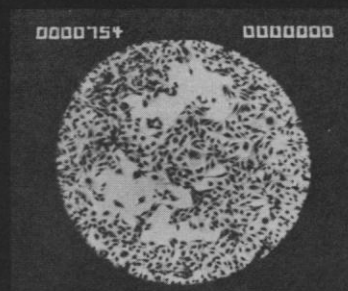
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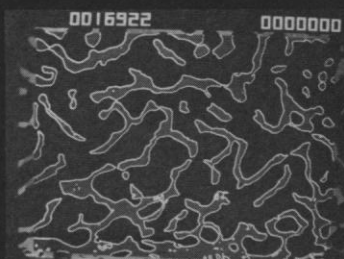
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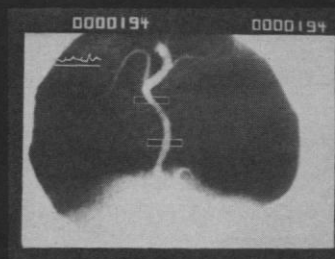
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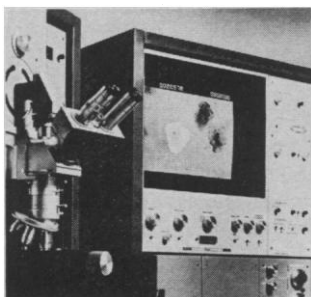


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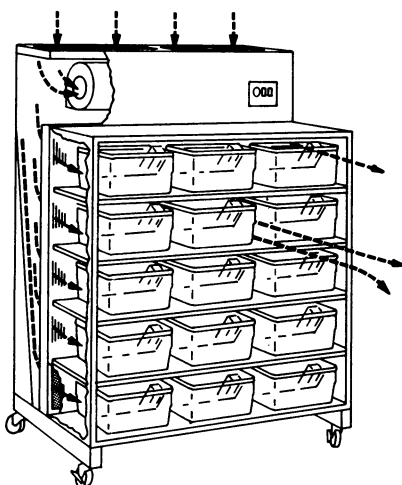


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Roszak and Rationality

Paraphrasing Clemenceau, it appears that "science is too important to leave to scientists." I have followed with amazement the sad chronicle of Theodore Roszak's challenge to science and the ineffectual response of the scientific community to it (see N. Wade, *News and Comment*, 12 Sept., p. 925).

I am not a scientist, but I have the same stake in science that every literate human being has—whether he knows it or not. Science, aside from technology, is one of the crucial modes of knowledge in our milieu.

It should be pointed out that Roszak's "challenge" is bogus, and only the general ignorance of scientists concerning matters outside their areas of expertise allows it to stand. "Gnosis" is not only a discarded and discredited piece of antiquity, it is also at the root of the modern mass movements which have rent our society asunder. In certain cases, gnosticism has even invaded science—or, more accurately, pseudo-science—with disastrous results.

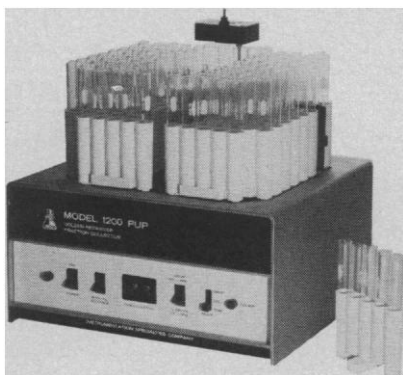
I wonder how many of those who wish to answer Roszak are familiar with Voegelin's *The New Science of Politics* (1), or his *Science, Politics, and Gnosticism* (2). How many have read Jonas' *The Gnostic Religion* (3), Cohn's *The Pursuit of the Millennium* (4), and de Lubac's *The Drama of Atheist Humanism* (5)? Further, a definitive answer to Roszak's contentions can be found in Charon's brilliant work, *Man in Search of Himself* (6). Charon, a noted physicist and member of the French Atomic Energy Commission, has used the insights of general relativity to open new vistas for those who seek knowledge, rather than "gnosis."

If attacks on science such as Roszak's should begin to corrode the morale of those scientists who read him, then the search for truth may end, and we will all be doomed to another dark age such as that predicted by Brown (7).

In his response to Roszak, Steven Weinberg says:

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the ordinary world of human perception . . . it is nature that dictates the direction of our search.

If one were to substitute "God" for "nature," the same words could have been spoken by St. Augustine, St. Thomas Aquinas, St. Paul, or Isaiah. The search for truth carries us where it will, not where we will. Roszak's assault on science seems to me to be no less than an assault upon the traditional Judeo-Christian search for a truth beyond human perception, be it theological or scientific.

JOHN WILLIAM CORRINGTON
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It is simply not true that rational Western science has severed its ties with the spiritual and mystical side of human nature. If Roszak and his colleagues feel that a scientific view deprives the world of mystery and wonder, they are mistaking technology, the manipulative offspring of science, for science itself. Scientific research begins with a wondering mind and concludes (insofar as the study of nature ever concludes) with even greater wonder. Thus, few practicing scientists feel the same bloodless certainty of knowledge that the layman often attributes to them.

Biochemist R. G. H. Siu (1) has pointed out that Taoist "no-knowledge" may actually provide a very useful mental set within which to approach scientific problems; I have enumerated some of the remarkable parallels between the vigorous modern science of ecology and the ancient Eastern teachings of Zen Buddhism (2).

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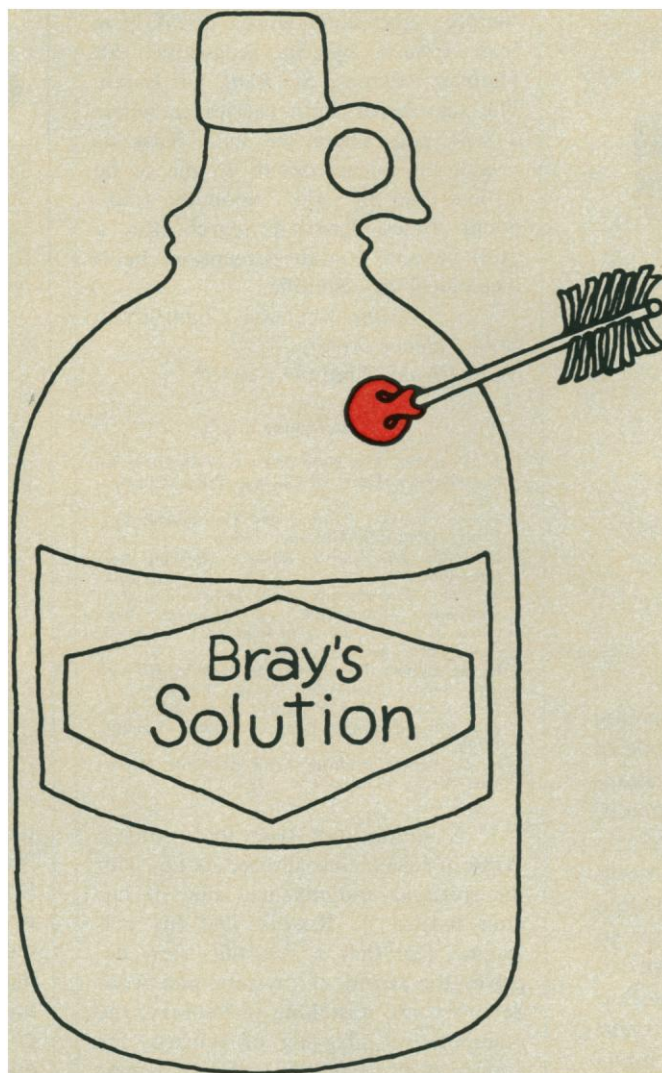
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Declining Years of Hydrocarbon Production

One of the hazards of maturity is a failure to recognize changes that accompany the aging process. When the first big snow falls, hundreds of older males charge out with their shovels and attack the white stuff. They behave as if they were youths of twenty. Heart attacks follow.

The analogy is imperfect with respect to the United States and its approach to energy problems. Nobody but nobody is charging around. However, there has been a failure to recognize the limitations accompanying the maturing process.

We remember ourselves as a nation of great technological competence that was able to place men on the moon. The present reality is that we cannot do well such a simple thing as burn coal. In addition, this nation is rapidly losing its ability to take hydrocarbons out of the ground, and there is no prospect that the ability will ever be fully restored. Yet the country acts as if it were in its youth when it could afford to squander its resources.

Perhaps, one day, there will be abundant supplies of energy derived from the sun, the wind, the oceans, fusion, or geothermal sources. But these sources will not make substantial contributions for a decade or two or three. Before we reach those promised lands of abundant energy, some of which may turn out to be mirages, we must endure the crippling realities of the next decade, and especially the next 3 years. Unless very substantial new areas are opened to exploration for oil and production is developed quickly, the energy content of domestically produced hydrocarbons could drop by as much as 30 percent during the next decade.

In any event, during the next 3 years before Alaskan oil flows, this nation's ability to produce energy from domestic hydrocarbons (oil and natural gas) will decline to 15 to 20 percent below what it was in October 1973 when the oil embargo began. Only a small part of this drop will be made up by energy from additional nuclear plants coming on line or by coal from underground mines.

Throughout this century, except for several years during the Depression, the United States has experienced steady growth in the use of energy. Unless we can obtain and pay for much larger imports of oil, the drop in energy consumption will be similar to that of the early 1930's. If the widely quoted relation between energy consumption and gross national product is valid, we face a long period of recession. In addition we face greatly heightened vulnerability to a new embargo.

Merely to maintain current total energy consumption would require increasing imports of oil by 2 to 3 million barrels a day over present levels. Recently, Canada announced that it was cutting back oil shipments to the United States, and Venezuela has curtailed production. Additional imports must come mainly from the Eastern Hemisphere.

Last winter was only a tiny sample of what might happen in the near term. The Arabs cut back production only 25 percent, the weather was mild, the effective duration of the embargo was about 3 months. With their present enormous dollar holdings, the Arabs could afford an embargo of more than a year's duration and with a much deeper cut in production.

Perhaps Dr. Kissinger can talk the oil producing and exporting countries out of indulging in the pleasures and profits of a new adventure. But maybe history will show that the Arabs merely used Dr. Kissinger.

We cannot afford to continue to procrastinate. Now, and for the next decade, time is against us. We should stop sitting on our behinds content with visions of a glorious past. If this country is to have a good future it must awake to the new scene and begin to move with programs of conservation, substitution for hydrocarbons, and development of additional sources of energy.—PHILIP H. ABELSON



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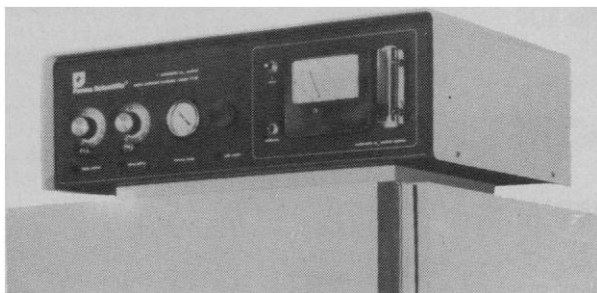
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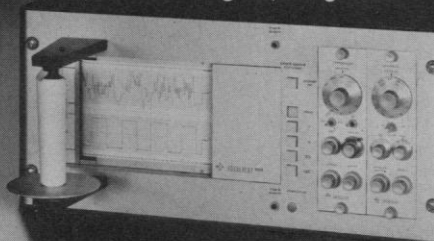
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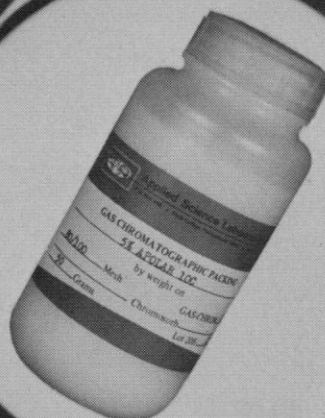
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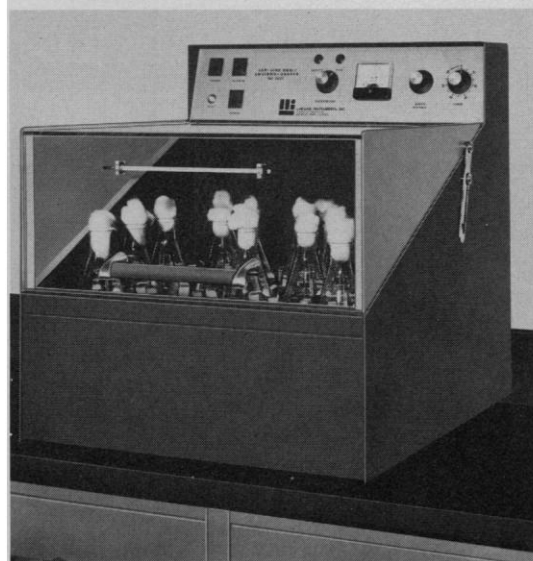
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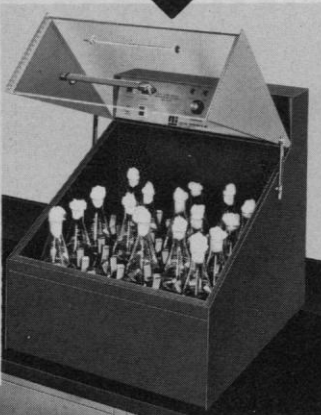
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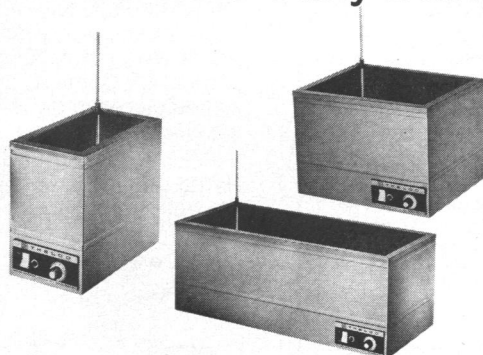
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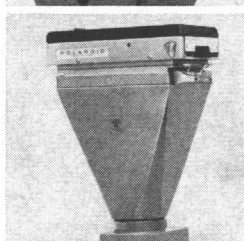
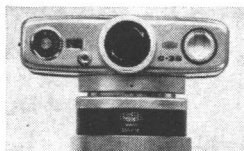
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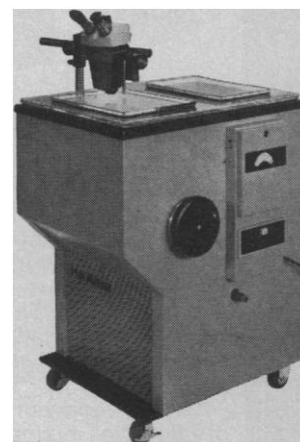
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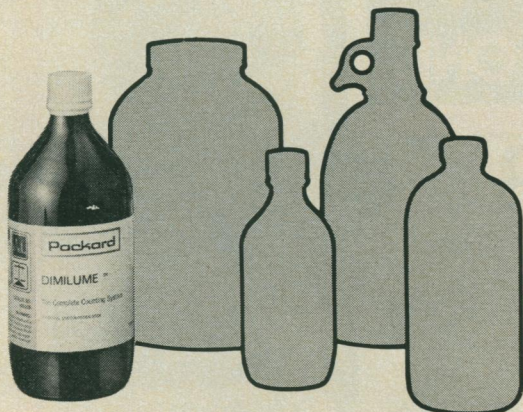
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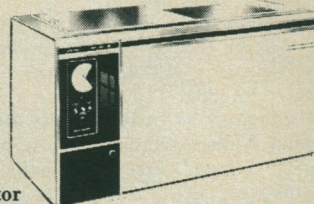
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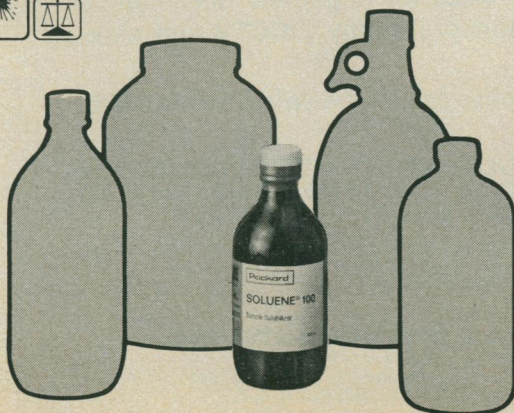
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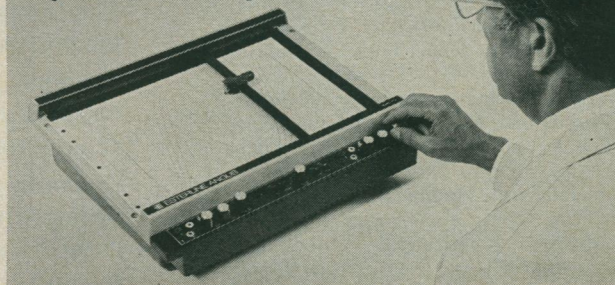


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PRODUCTS and MATERIALS

Shock Measurement and Recording System

The 2730 system has a digital memory that allows capture of short-duration transients and immediate display of data on oscilloscope and strip-chart recorder. Designed to be used with either piezoelectric or piezoresistive accelerometers, the system conditions the signal, displays pulse peak amplitude and width, and feeds the signal through an analog-to-digital converter to a shift-register memory for capture and retention. A digital-to-analog converter provides a reconstructed analog signal for display on the monitor and for recording. The system consists of five modules: model 2740A shock amplifier; model 2743 pulse memory system, a 10-bit, 1024-word shift-register memory; model 2745 monitor oscilloscope; model 2744 strip-chart recorder; and model 2742A digital display for peak pulse amplitude in gravitational units and pulse width in milliseconds. Endevco. Circle No. 749 on Readers' Service Card.

Rotating Evaporator

The Rotavapor M (Fig. 1) is suitable for evaporating volumes of from 5 to 100 milliliters. All glassware is threaded so no grease is needed. A revolving condenser allows a change from reflux to distillation while the unit moves. Applications include Grignard reactions, Friedel-Crafts acetylations, esterification, Soxhlet extractions of solids, fractional distillation, freeze drying, and many others. The device comes with four evaporating flasks (30, 50, 100, and 200 milliliters), three receiving flasks (50, 100, and 250 milliliters), a complete set of spare vacuum seals, and either a V-stand or thermostatically controlled heating bath. Brinkmann Instruments, Incorporated. Circle No. 742 on Readers' Service Card.

Electronic Fever Thermometer

The AMI-THERM is designed for clinical applications. Accurate, easy-to-read measurements are made in less than 30 seconds. The device is solid state and weighs 3 ounces. It operates on a standard 9-volt transistor battery. Oral and rectal models are available. Accuracy is within ± 0.2 degree. The devices are sold with disposable probe covers for sanitary purposes. The units cost about \$20. AMI Medical Electronics Division, LMC Data. Circle No. 753 on Readers' Service Card.

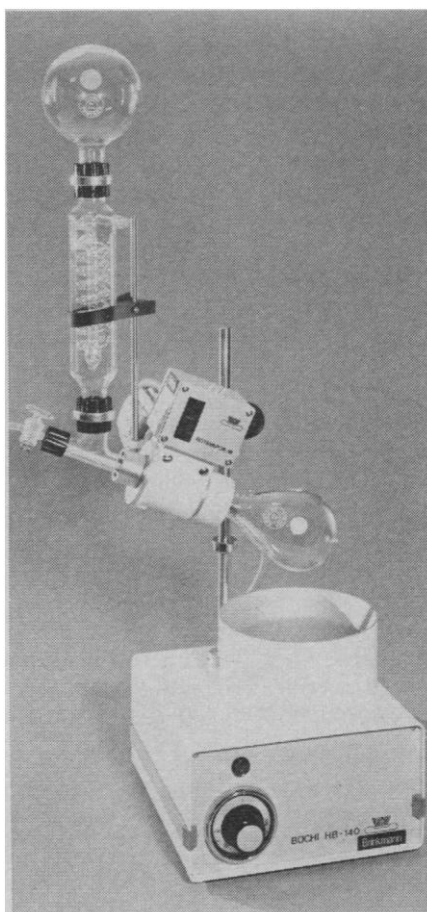


Fig. 1. The Rotavapor M is suitable for small volumes. Rotation speed is fixed at 150 revolutions per minute. An optional heating bath is controlled from 30° to 110°C.

Freezer

The model PR100G features temperature control to -100°F . It is designed for testing electronic components, shrink-fit assembly, metal stabilization, storage, and research. The cabinet is steel with a counterbalanced lid. The temperature control indicates and regulates. The cabinet features an air-cooled condenser; no liquid coolant is required. Chamber dimensions are 55 by 18 by 21 inches; outer dimensions are 65 by 28 by 48 inches. The device may be equipped with recorder and a buzzer-alarm system. So-Low Environmental Equipment Company, Incorporated. Circle No. 752 on Readers' Service Card.

Laboratory Cat Diet

Respond Kitty Morsels are packaged in 25-pound sacks. They meet or exceed all nutrition standards established by the National Research Council. They are rendered palatable by a fish-like aroma and taste. Protein and sulfur amino acid contents are high and vitamin and mineral contents are balanced as well. Analysis yields the following: crude protein, 31 percent (minimum); crude fat, 8 percent (minimum); crude fiber, 3 percent (maximum); ash, 12 percent (maximum); and moisture, 11 percent (maximum). The ingredients are listed on the package label. Agway Incorporated. Circle No. 745 on Readers' Service Card.

Ultraviolet Photometer

The Uvicord III employs two light sources. Standard equipment includes filters for 254 and 280 nanometers and filters for 206, 340, and 365 nanometers are optional. The device has a scale selection switch that allows the equivalent of 0 to 1.0 extinction unit (0 to 100 percent transmittance) or 0 to 0.2 extinction unit (80 to 100 percent transmittance). Applications include identification of many biological

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substances including nonaromatic peptides and some saccharides at 206 nanometers. Simultaneous measurements are made with dual wavelengths on the sample cell and on a reference cell so that one 4-second measurement provides four outputs. LKB Instruments, Incorporated. Circle No. 743 on Readers' Service Card.

Cardiovascular Analog Trainer

The CAT is a programmed analog computer designed for physiology teaching. It simulates cardiovascular functions and abnormalities. Symptoms relating to a four-chambered heart and to pulmonary, arterial, capillary, and venous circulation are simulated with or without baroreceptor regulation. Pressure, flow, and volume are represented by analogous voltage, current, and charge in the computer. These parameters may be monitored and controlled and there is provision for simulation of bleeding and transfusion and the administration of drugs. Harvard Apparatus Company, Incorporated. Circle No. 744 on Readers' Service Card.

Programmable Calculator

The PC-1002 series of calculators includes instruments with 15 scientific functions and 10 built-in programs. In addition each model has a Programmable-Read Only Memory (P-ROM) chip with 256 programming steps which can be divided into four separate program groups operated by an independent set of keys. In the series there are four models, each programmed for different applications: statistics, mathematics, metric conversion, and surveying. The calculators have ten digits mantissa, two digits exponent, and eight memory registers. There is a floating decimal point for mantissa and one for exponent. Sharp Electronics Corporation. Circle No. 751 on Readers' Service Card.

Computer

The Nova 830 uses high-capacity 32,000-byte, 1-microsecond core memory units. The processor has 128,000 bytes of main memory, memory management option, power supply, and console panel with ten slots available for system memory and input-output

interfaces. The Nova 830 has full hardware protected dual operations, standard dual-processor/shared disk operations, memory mapping with 2,000-byte boundaries, and support of a full 256,000 bytes of memory in one processor. Options include floating point processor, peripherals, and input-output devices. Data General Corporation. Circle No. 750 on Readers' Service Card.

Digital Multimeter

The model 160B is sensitive from 1 microvolt per digit to 1200 volts full range. It can measure current from 10 picoamperes per digit to 2 amperes full range and it detects resistance from 1 milliohm per digit to 2000 megohms full range. The zero stability is 0.2 microvolt per degree Celsius and this is not affected when the device is powered by the optional rechargeable battery pack. Analog output is available for recording applications. Input is isolated from power line and it may be floated up to 1200 volts off ground even when the unit is line operated. Input impedance is 10^7 ohms on all ranges. Keithley Instruments, Incorporated. Circle No. 746 on Readers' Service Card.

Microsyringe Pipet

These devices are spring-loaded and they deliver samples in the microliter range with accuracy of ± 1 percent. They are suitable for radioimmunoassay, electrophoresis, and radioimmunodiffusion. They feature disposable tips to avoid the possibility of cross contamination. Set volumes may be dispensed by pressing the plunger to an auxiliary stop prior to discharge. The sample to be dispensed is confined to the plastic tip until discharged. They are available in 10- and 25-microliter sizes with a permanently affixed needle. Hamilton Company. Circle No. 748 on Readers' Service Card.

Literature

Chromatography, Electrophoresis and Membrane Filtration Products are featured in a fold-out color brochure. Gelman Instrument Company. Circle No. 733 on Readers' Service Card.

Ink Cross References lists part num-

bers, colors, and sizes of recorder inks of major manufacturers. Graphic Controls Incorporated. Circle No. 741 on Readers' Service Card.

The *1974 Guide to Scientific Instruments* lists 2000 manufacturers in 3000 product categories. The *Guide* is the definitive reference for selection and purchase of clinical, academic, and research instruments, chemicals, supplies, and systems. If you are a *Science* subscriber or a AAAS member, you will receive the *Guide* as part of your subscription. Others may order the *Guide* from AAAS Publications Sales Department at \$4 per copy. AAAS. Circle No. 754 on Readers' Service Card.

Introduction to the Sonic Flowmeter describes a line of obstructionless devices for pure and solids-laden liquids in full pipes. NUSonics, Incorporated. Circle No. 755 on Readers' Service Card.

Corinth 500 Electron Microscope gives specifications, design features, and applications of this biological device. AEI Scientific Apparatus. Circle No. 756 on Readers' Service Card.

Instruments for Water Pollution Monitoring and Process Control is a 16-page catalog of instrumentation. Ionics, Incorporated. Circle No. 757 on Readers' Service Card.

Flatbed Recorders is devoted to a line of null-balance zero-type potentiometric devices. Enraf-Nonius, Incorporated. Circle No. 758 on Readers' Service Card.

Modular d-c Power Supplies and Voltage References describes more than 70,000 possible combinations of these electronic components. CEA Division, Berkleonics, Incorporated. Circle No. 759 on Readers' Service Card.

Microanalytical Systems describes a technique for analyses of elements, gases, and nuclides that are released by laser volatilization from selected portions of a solid. Megru Microanalytical Systems. Circle No. 760 on Readers' Service Card.

Chromatography Catalog is a 76-page list of instruments, accessories, and supplies. It details design features and performance specifications. Varian Associates, Instrument Division. Circle No. 761 on Readers' Service Card.

The Microscope as a Shop Tool illustrates applications of microscopy to detailed measurement in industry and research. Gaertner Scientific Corporation. Circle No. 762 on Readers' Service Card.

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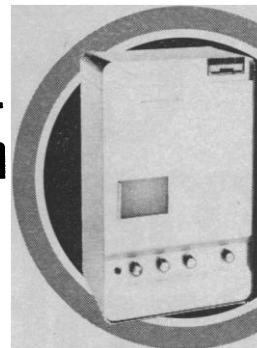
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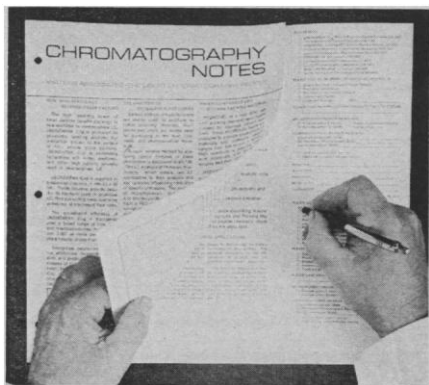


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NEWS AND COMMENT

(Continued from page 1010)

RECENT DEATHS

Vigfus S. Asmundson, 78; professor emeritus of avian sciences, University of California, Davis; 10 September.

John T. Baldwin, Jr., 63; professor of biology, William and Mary College; 3 September.

Florence Black, 84; former associate professor of mathematics, University of Kansas; 13 September.

Jacob Bronowski, 66; senior fellow, Salk Institute for Biological Studies; 21 August.

Dan H. Campbell, 67; professor of immunochemistry, California Institute of Technology; 16 September.

James Colbert, Jr., 53; vice president for academic affairs, Medical University of South Carolina; 11 September.

Howard W. Dunne, 61; professor of veterinary science, Pennsylvania State University; 10 September.

Alfonso Elder, 76; former president, North Carolina Central University; 7 August.

Harold Friedlander, 61; microbiologist, Division of Research Grants, National Institutes of Health; 22 June.

Mary L. Gambrell, 76; former president, Hunter College, City College of New York; 19 August.

Antoine M. Gaudin, 74; professor emeritus of mineral engineering, Massachusetts Institute of Technology; 23 August.

Elliot Gillerman, 60; director, North College, University of Kansas; 10 July.

John W. Graham, Jr., 59; chancellor, Clarkson College of Technology; 21 September.

Henry R. Henze, 78; professor emeritus of chemistry, University of Texas; 21 September.

Walter N. Hess, 84; retired head, biology department, Hamilton College; 21 August.

Leslie A. Holmes, 71; former president, Northern Illinois University; 21 August.

Clyde H. Jones, 72; former professor of botany, Ohio State University; 8 August.

Daniel Kaufman, 63; associate professor of urology, New York Medical College; 27 August.

William F. Kean, 61; director of education, Canisius College; 18 September.

Robert H. Knapp, 59; professor of

psychology, Wesleyan University; 8 September.

Dorothea McCarthy, 68; former professor of psychology, Fordham University; 22 September.

Clarence Mills, 81; former professor of experimental medicine, University of Cincinnati; 17 September.

I. Arthur Mirsky, 67; professor of clinical sciences, University of Pittsburgh; 16 September.

Jeremy Musher, 38; professor of chemistry, Graduate School of Science, Yeshiva University; 6 September.

Harry K. Newman, 68; former president, University of Oregon, University of Montana, and Cleveland State University; 25 August.

Charles Norman, 58; professor of biology, West Virginia University; 30 August.

Lawrence Ordin, 47; professor of biochemistry, University of California, Riverside; 9 August.

Gertrude E. Perlmann, 62; professor of protein chemistry, Rockefeller University; 9 September.

Hubert E. Risser, 60; professor of mineral economics, University of Illinois; 6 September.

Frank L. Robeson, 90; professor emeritus of physics, Virginia Polytechnic Institute and State University; 2 September.

Benjamin B. Ross, 50; professor of physiology, University of Oregon Medical School; 18 September.

Henry W. Scherp, 66; retired microbiologist, National Institute of Dental Research, National Institutes of Health; 16 August.

Edward R. Schlesinger, 63; head, maternal and child health program, Graduate School of Public Health, University of Pittsburgh; 21 August.

George I. Schwartz, 66; visiting professor of biology, New York University; 15 September.

Rene A. Spitz, 87; visiting professor emeritus of psychiatry, University of Colorado School of Medicine; 14 September.

Harold L. Yochum, 71; president emeritus, Capital University; 1 September.

Hans H. Zinsser, 57; associate professor of clinical urology, Columbia University; 14 August.

Erratum: In the report by D. H. Ross, M. A. Medina, and H. L. Cardenas [*Science* **186**, 63 (1974)] the concentration of ethanol given on line 6 of Table 1 should be 1.5 g/kg.

Erratum: In the cover legend of 22 November 1974 the Morgantown Generating Station was rated at 1.1 milliwatts; it should have read 1100 megawatts.