SCIENCE

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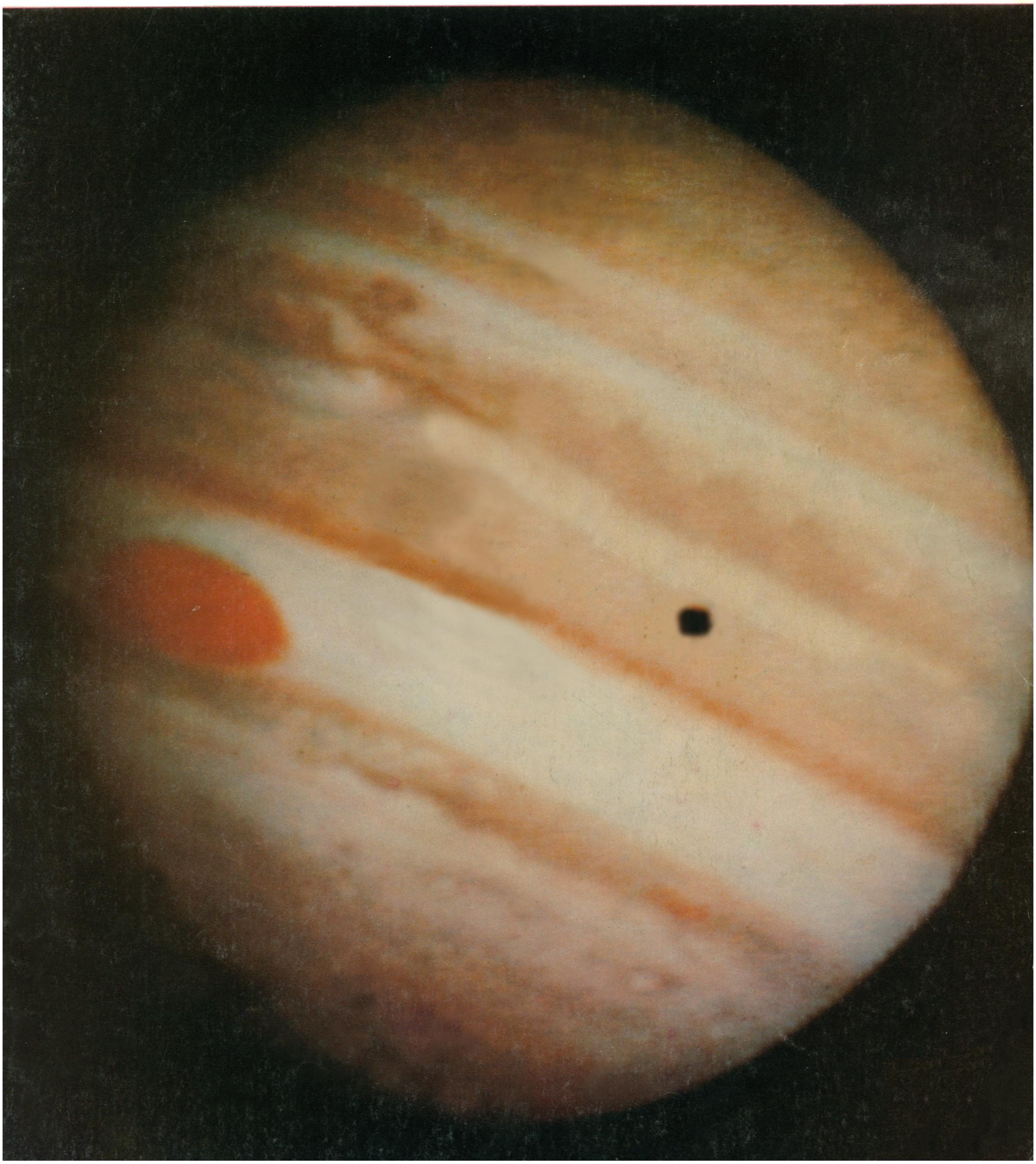
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



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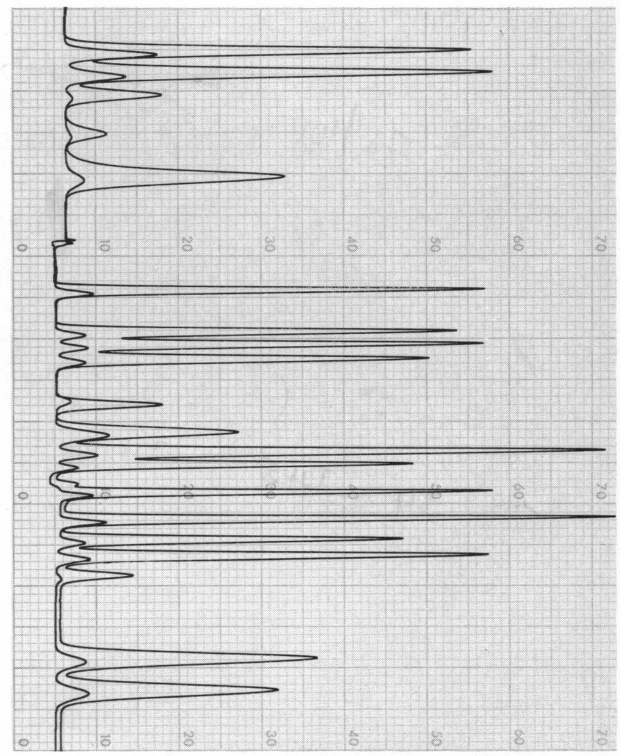

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COVER

Jupiter's red spot and a shadow of the moon (plus Jupiter's cloud structure) taken at 11:02 p.m. on 1 December as NASA's Pioneer 10 spacecraft was about 2.5 million kilometers from the planet. Images are made on tapes; flown into Tucson daily; and processed in black and white after being rectified and interpolated at the University of Arizona. See page 301. [National Aeronautics and Space Administration, Washington, D.C.]

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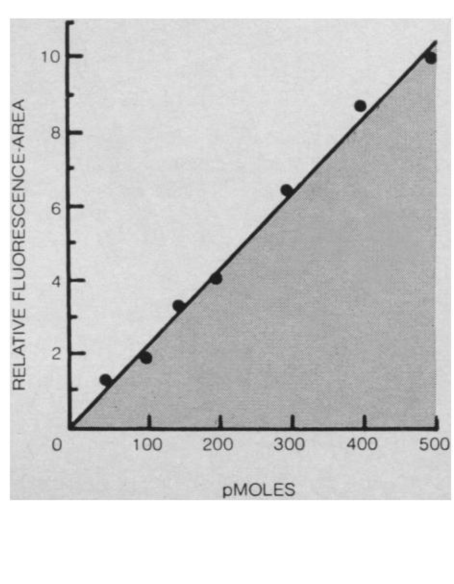

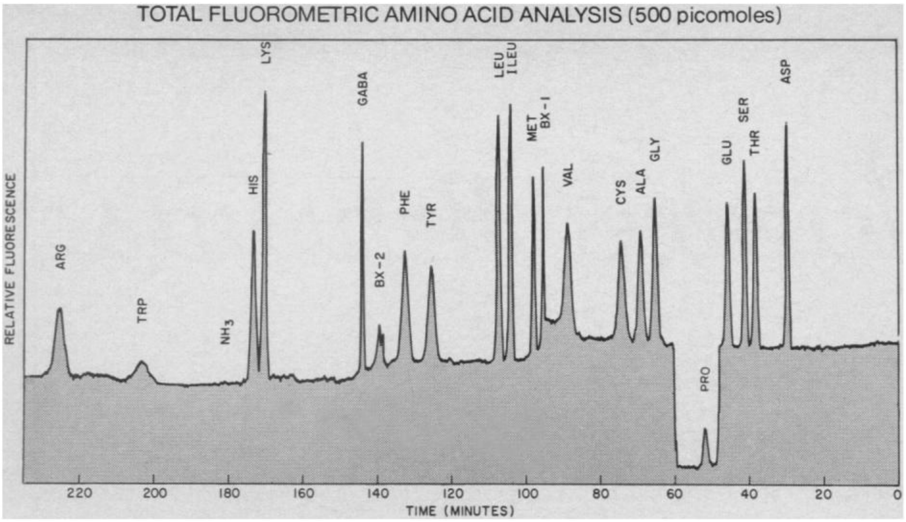

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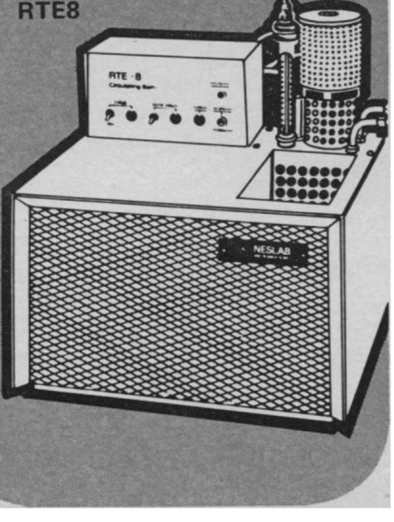

an almost impossible time frame and, at the same time, make appropriate trade-offs with energy efficiency, vehicle function (personal mobility), manufacturability, reliability, durability, safety, comfort, convenience, cost, and customer acceptance in a competitive market. The task is extremely complex and difficult, and we can use all the understanding and help we can get. Many members of the American Chemical Society are already involved in this effort. We appreciate the interest now evidenced by their former president.

WILLIAM G. AGNEW
General Motors Corporation,
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General Motors Technical Center,
Warren, Michigan 48090

References and Notes

1. Another 6 percent was lost during the same period because of weight additions required to meet safety regulations and other factors.
2. Additional fuel economy gains will be realized in 1975 model cars as a result of a change in vehicle product mix.
3. For a report of considerable basic combustion work in the latter area, see W. Cornelius and W. G. Agnew, Eds., *Emissions from Continuous Combustion Systems* (General Motors Symposium Series, Plenum, New York, 1972).

Marathoning

In response to Puretz, Young, and Baron (Letters, 14 Dec. 1973, p. 1082), I can only repeat that there has never been a reported death from coronary heart disease among marathon finishers of any age (*1*). Finishers are defined as those covering the 42.2-kilometer course in less than 4 hours. Only autopsied cases can be considered.

Puretz suggests that Paavo Nurmi might be the first such case, and Baron brings up Pheidippides; however, Nurmi never ran a full 42.2-kilometer course (*2*), and Pheidippides probably did not even exist (*3*).

Nurmi broke world records in races of up to 20 kilometers but refused to run marathon distances in practice for fear that it would slow him down. He was a remarkable middle-distance runner, not a marathoner. Puretz is mistaken about the 1928 Olympic marathon. The winner was a Frenchman, not Nurmi (who was not even entered).

The modern Tarahumara Indians, like the legendary Pheidippides, demonstrate their endurance with races of 160 kilometers and longer. The limiting somatic factor in these "marathons" is skeletal muscle rather than cardiac

muscle. Deaths from cardiac or circulatory complications are unknown among the Tarahumara (4).

I agree with Young. It is the marathoner's life-style that protects him. The race only quantitates the benefits. Rehabilitation centers in Honolulu and Toronto have a formal distance-running program for those cardiac patients who wish to adopt this life-style. The marathon run becomes the natural "graduation ceremony" (5). The Hawaii Heart Association presented trophies to five such patients at their recent Honolulu Marathon (16 December 1973). These patients had trained for the marathon after recovering from one or more myocardial infarctions (6).

The American Medical Joggers Association was one of the cosponsors of the Honolulu Marathon. Only time will tell whether these marathoning heart patients will share the coronary protection of the Olympic athletes.

THOMAS J. BASSLER
Centinela Valley Community Hospital, 555 East Hardy Street, Inglewood, California 90307

References

1. T. J. Bassler, *J. Am. Med. Assoc.* **223**, 1391 (1973).
2. P. Lovesey, *The Kings of Distance* (Eyre & Spottiswoode, London, 1968), pp. 91–116.
3. M. Steffny, in *1973 Marathon Handbook*, J. Henderson, Ed. (Runner's World Magazine, Mountain View, Calif., 1973), pp. 27–29.
4. D. Groom, *Am. Heart J.* **81**, 304 (1971).
5. T. J. Bassler, *J. Am. Med. Assoc.* **226**, 790 (1973).
6. Honolulu *Advertiser*, 17 December 1973, p. D-2.

Rainfall in the Amazon Basin

Portig (Letters, 26 Jan. 1968, p. 376) and Feininger (Letters, 5 April 1968, p. 13) presented evidence that average annual rainfall in certain tropical Latin American countries was decreasing dramatically and that this decrease (as much as 24 percent from 1942 to 1967 in Colombia) was correlated with widespread felling of the Amazon basin forest. New data obtained in Ecuador in July 1973 suggest a disturbing major change in the overall picture of climatic changes in the western Amazon basin of South America.

On 10 July and 13 July 1973, during flights between Quito and Limoncocha (a missionary outpost in the Amazonian rain forest on the Río Napo in eastern Ecuador), a strong and widespread haze of smoke particles was observed

over the Amazon basin at an altitude of about 2000 feet. According to pilots and residents subsequently interviewed in this area, the haze has become a daily weather feature over the past 2 years, coinciding with the discovery of major oil fields in northeastern Ecuador and the burning-off of the new wells. Columns of smoke from burning wells were observed and photographed across the entire horizon on these flights. Rainfall records kept at Limoncocha indicate that the average annual rainfall has increased from about 100 inches (1961 to 1970) to 140 inches today. It seems likely that particulate matter in the haze is serving as nuclei for condensation and thus leading to greater levels of precipitation, as occurred in the area of La Porte, Indiana, which is east of Chicago and Gary (*1*).

This ecological change, whether it is caused by air pollutants released by the burning oil wells or by unknown long-term cyclical factors, should be carefully studied by scientists working in the western Amazon basin in future months. The consequences of widespread rainfall changes in the tropics are of obvious economic, agricultural, and ecological importance to the developing countries.

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Gainesville 32601

References

1. T. C. Emmel, *An Introduction to Ecology and Population Biology* (Norton, New York, 1973), p. 144.

Radiation Effects

Harald Trefall (Letters, 23 Nov. 1973, p. 776) raises questions about the effects of radiation as represented in Gillette's review (News and Comment, 1 Dec. 1972, p. 966) of the BEIR (Biological Effects of Ionizing Radiations) report (*1*). A careful reading of the report would answer most of Trefall's questions, particularly his semantic difficulties with the expression "extra deaths," which incidentally was not used in the report (illogically or otherwise). However, there is an urgent need for the public to understand about the biological costs of the side effects of technology (including radiation), particularly about the comparative risks of available options, so that logical decisions about new or expanding technologies can be made and accepted.

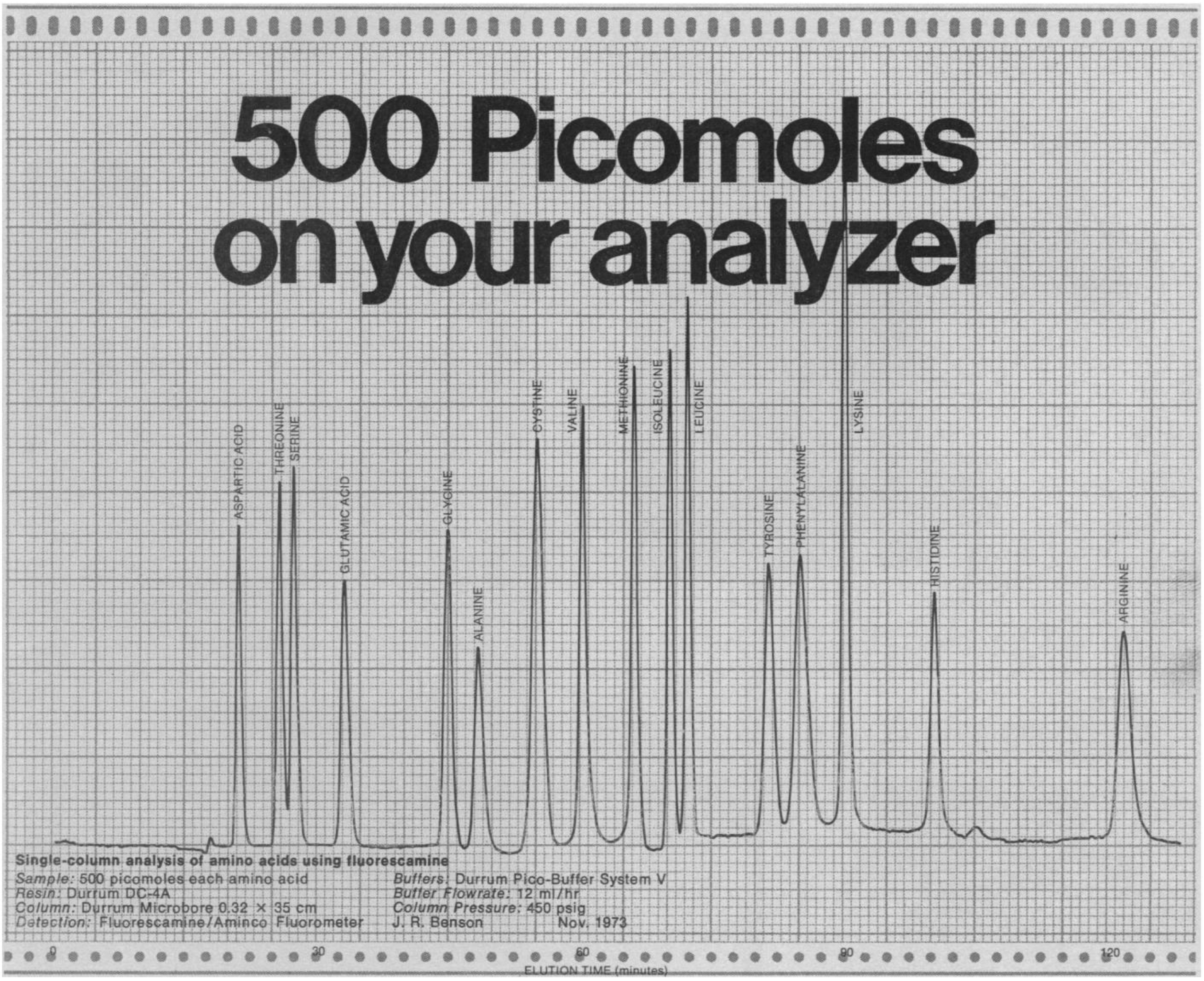
Trefall oversimplifies in stating that agents can "cause *premature* deaths, no more and no less" and in proposing that effects of radiation exposure be expressed in terms of average reduced life-span. The ethical ideal that every being has a right to be born without man-induced defects and to die from old age (the natural wearing out of the body) is fully recognized. However, it is obvious that all early deaths do not have the same societal and personal impact. For example, the death of an embryo before anyone even knows about it or the death of an elderly person a few years before he or she would otherwise die of old age would not penalize the individual, the persons left behind, or society, as would the death of a young adult with family responsibilities on the brink of a productive career. In addition, genetic effects can produce a variety of suffering and health costs over a lifetime which, while they do not necessarily cause early deaths, do constitute a biological cost. At present, it is not possible in the formulation of radiation risk values to estimate the number of person-years lost because of the agent and somehow to weight them so that societal and personal considerations are taken into account. With more data and competence we hope to move in this direction.

In the meantime, the genetic risk estimates in the BEIR report refer to the production per year by additional radiation of cases of serious, dominant, or X-linked diseases and defects plus congenital abnormalities and constitutional diseases that are partly genetic. The somatic risk estimates refer to annual excess mortality from cancer that could be produced by the additional radiation. It may be that such numbers, used by themselves out of context, do sound "horrible" and tend to overemphasize the risk; on the other hand, the calculations of average life-span reduction proposed by Trefall do not seem to convey an easily understood sense of reality, especially in terms of the possible effects on individuals.

C. L. COMAR
Department of Physical Biology,
New York State Veterinary College,
Cornell University, Ithaca 14850

References

1. *The Effects on Populations of Exposure to Low Levels of Ionizing Radiation* (Report of Advisory Committee on the Biological Effects of Ionizing Radiations, National Academy of Sciences–National Research Council) (Government Printing Office, Washington, D.C., 1972).



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1. S. Udenfriend, S. Stein, P. Bohlen, W. Dairman, W. Leimgruber, M. Weigele, *Science 178*, 871 (1972).
2. S. Stein, P. Bohlen, J. Stone, W. Dairman, S. Udenfriend, *Arch. Biochem. and Biophys. 155*, 203 (1973).
3. S. Udenfriend, S. Stein, P. Bohlen, W. Dairman, *Third American Peptide Symposium, Boston, June 1972*, J. Meienhofer, Ed., (Ann Arbor—Humphrey Science, Ann Arbor, Michigan).
4. A. G. Georgiadis, J. W. Coffey, *Anal. Biochem.* (in press).
5. P. E. Hare, *Carnegie Institution in Washington Yearbook 1972* (in press).

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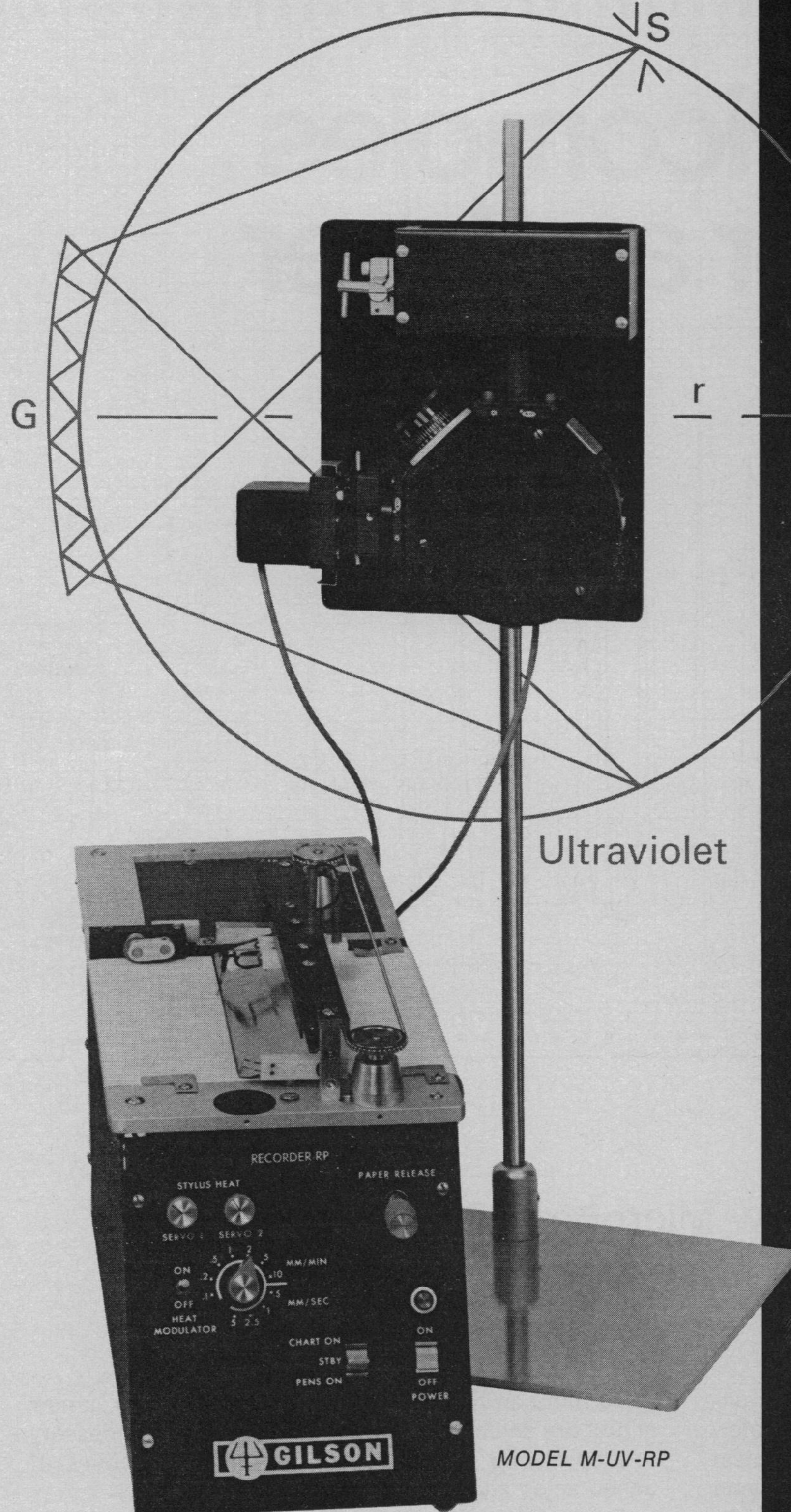

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25 January 1974, Volume 183, Number 4122

SCIENCE

Pioneer 10 Mission to Jupiter

If we are to understand the origin and evolution of the solar system, we must know more about the heavy planets situated beyond the asteroid belt. Collectively, these make up more than 99 percent of the mass of the planets, and they possess most of the angular momentum of the solar system.

By far the largest of the planets is Jupiter, which has a radius of 71,600 km and a mass 318 times that of Earth. Optically one of the brightest bodies in the heavens, Jupiter is reminiscent of a ham actor calling attention to himself. As seen from Earth, the planet has a unique banded structure, a big red spot, and variable coloration. Aside from the Sun, Jupiter is for radio astronomers the noisiest object in the sky. Sporadically, the planet emits great electromagnetic bursts equivalent in energy to those of megaton thermonuclear devices. These bursts are in addition to large quantities of synchrotron radiation, which indicate that Jupiter has a strong magnetic field. In contrast to the other planets, Jupiter also emits more energy in the infrared than the total energy it receives from the Sun. As befits a spectacular performer, Jupiter is accompanied by not one moon, but 12.

With these features as a lure, Jupiter has had the attention of Earth-based observers for a long time, and it is they who have provided most of the knowledge about it. The successful Jupiter flyby of Pioneer 10 has now added a substantial amount of information, which will grow as the records are analyzed in detail (see reports in this issue).

If anything, the new results add to the dramatic qualities of Jupiter. In its flyby of the planet, the spacecraft encountered large numbers of higly energetic electrons, protons, and helium nuclei and a correspondingly large exposure to radiation. For man, a whole body dose of about 500 rads is lethal. The spacecraft received an integrated dose of 200,000 rads from electrons and 50,000 rads from protons of energy above 30 Mev.

The spacecraft also encountered a large magnetic field. The total energy represented by Jupiter's field is 250,000 times that of Earth. In free space, the solar wind moves with a velocity of about 2×10^8 cm per second. However, at distances even greater than 7 million km from the planet, its magnetic field was found to be deflecting the wind.

Pioneer 10 experimenters discovered that the center of the magnetic dipole was removed 18,000 km from the center of the planet and that the axis of the dipole was at an angle of about 15° to the axis of rotation. What causes the magnetic field? Jupiter has an average density of about 1, in contrast to 5 for Earth. Does Jupiter have a core of metallic hydrogen, or perhaps a core of materials similar to that of Earth?

The flyby also added further evidence that Jupiter is dissipating energy in many ways. It showed that the planet radiates about 2.5 times as much energy as it receives. Pictures also lent further evidence of violent convective processes in the planet's atmosphere. Where is all the energy coming from?

One of the impressive features of the Pioneer 10 mission was the performance of the spacecraft and its scientific equipment. Although Pioneer 10 is about 800 million km distant, two-way communication with Earth is being maintained (travel time for a message is 45 minutes). One of the experimental setups required 15,000 commands from Earth. These were delivered and acted on. The craft, with its transmitter of only 8 watts, has been storing and sending tremendous quantities of data to Earth. Even after their radiation exposure during flyby, the electronics components continue to function well as Pioneer 10 proceeds on its way out of the solar system.—PHILIP H. ABELSON

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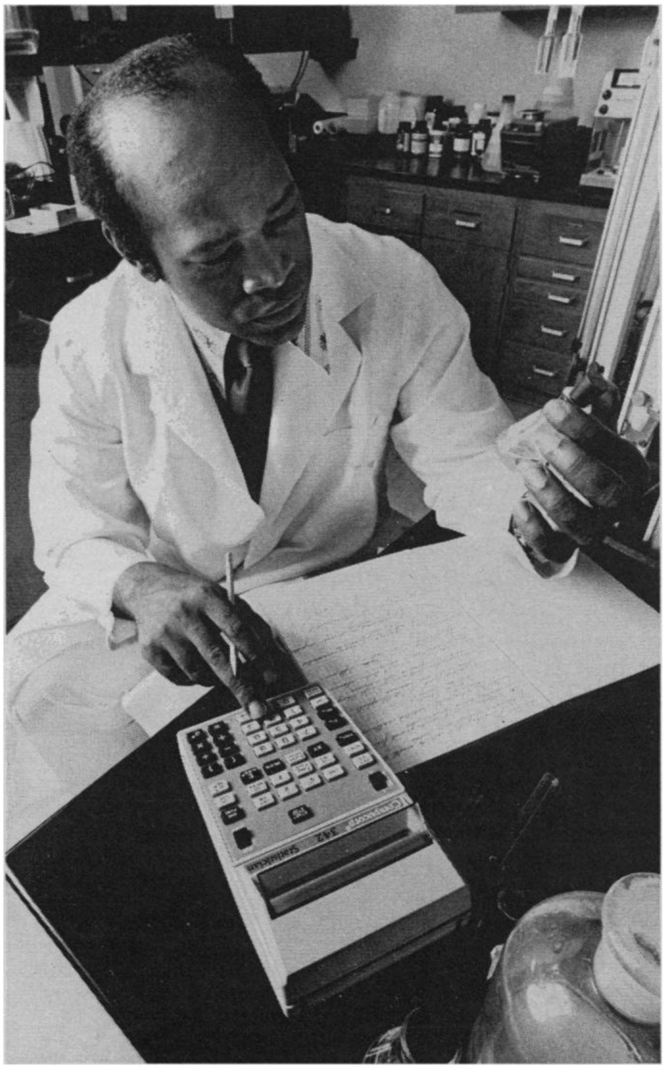

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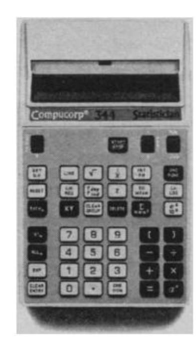

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PRODUCTS and MATERIALS

Graphic Display Interface for Minicomputers

The BP-721 converts any d-c coupled X-Y oscilloscope or other display device into a graphics display terminal. The unit enables the plotting of points, lines, alphanumerics, and real-time dynamic displays. Software features BASIC language commands. Real-time dynamic displays are flicker-free due to a 50-hertz scope refresh provided by internal semiconductor memory. The resolution is ± 0.2 percent on the X and Y axes. This can be increased to 0.05 percent with a larger unit. The memory capacity is 256 points which is also expandable to 1024 points. Megatek Corporation. Circle No. 130 on Readers' Service Card.

Microscope Slide Mount

The Thomas-Cobb slide mount enables the user to view a specimen from either side under oil immersion. The system consists of two cover glasses (with the specimen between them) held in a soft aluminum frame that has an 18-millimeter hole in the center. The cover glasses with the specimen are placed on the frame over the hole and a thin square vinyl insert is placed on each side of the mount. The edges of the frame are crimped to hold the inserts and mount in place and the result is a microscope slide that may be viewed under high magnification from top or bottom. Arthur H. Thomas Company. Circle No. 132 on Readers' Service Card.

Fig. 1. Disposable plastic tips for liquid transfer are available from Oxford Laboratories. They are shown here with the Macro-Set pipetting device. The tips are sterilized with gamma radiation and color coded by capacity.

Sterile Tips for Liquid Transfer

Disposable plastic tips (Fig. 1) for liquid handling instruments are sterilized by radiation from a cobalt-60 source. They are individually wrapped and color coded to indicate capacity. The individual wrapping and method of sterilization ensure that they need not be touched from sterilization through disposal. Irradiation is more effective for such sterilization than is the use of gas and it is easier on the product than heat treatment. The tips are made of polypropylene. Oxford Laboratories. Circle No. 131 on Readers' Service Card.

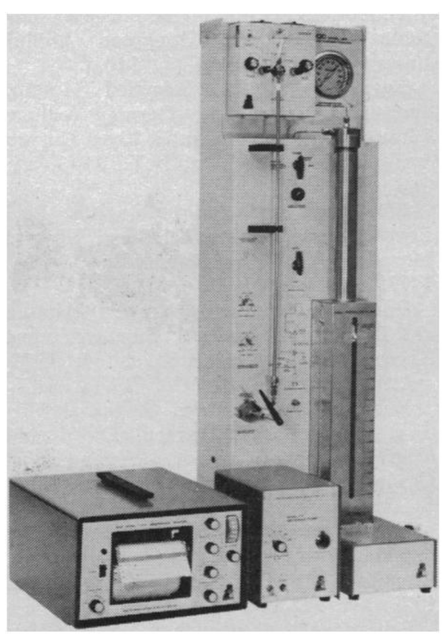

Fig. 2. The ISCO model 1440 high pressure liquid chromatograph. The pump develops up to 2000 pounds per square inch.

Liquid Chromatograph

The model 1440 chromatograph (Fig. 2) features a constant-flow, pulseless solvent pump for isocratic or gradient elution. The pump develops up to 2000 pounds per square inch. Solvent changing is facilitated by rapid refill and washout valves. Sample injection is rapid and reproducible with the six-port injection valve. Stainless steel columns with nonclogging fittings and no dead volume are featured. The dual-beam photometer has eight full-scale absorbance ranges from 0.01 Å to 2.0 Å, low noise, micro flow cells, and 13 operating wavelengths. Instrumentation Specialties Company (ISCO). Circle No. 137 on Readers' Service Card.

Literature

Calculations is a quarterly magazine that deals with applications of calculators and software to scientific research problems. Tektronix, Incorporated. Circle No. 132 on Readers' Service Card.

Edmund Catalog 735 describes more than 4000 items of use in science education, research, and science related avocations. Edmund Scientific Company. Circle No. 134 on Readers' Service Card.

Variscan Detector System for Continuously Variable Wavelength UV Detection is an eight-page brochure devoted to systems for liquid chromatography. It includes performance and design parameters as well as sample spectra. Varian Associates, Instrument Division. Circle No. 135 on Readers' Service Card.

Collaborative Research Catalog No. 2 lists defined sequence oligonucleotides and radioimmunoassay reagents. Collaborative Research, Incorporated. Circle No. 136 on Readers' Service Card.

Newly offered instrumentation, apparatus, and laboratory materials of interest to researchers in all disciplines in academic, industrial, and governmental organizations are featured in this space. Emphasis is given to purpose, chief characteristics, and availability of products and materials. Endorsement by *Science* or AAAS is not implied. Additional information may be obtained from the manufacturers or suppliers named by circling the appropriate number on the Readers' Service Card (see pages 258A and 338C) and placing it in the mailbox. Postage is free.—RICHARD G. SOMMER

BOOKS RECEIVED

(Continued from page 300)

and Health Services. Madrid, Mar. 1973. Asociación Española para el Control de la Calidad, Madrid, 1973. 250 pp., illus. Paper, 500 pesetas.

Cospar Life Sciences and Space Research 11. Proceedings of a meeting, Madrid, May 1972. P. H. A. Sneath, Ed. Akademie, Berlin, 1973. x, 308 pp., illus. DM 64.

Crime in Developing Countries. A Comparative Perspective. Marshall B. Clinard and Daniel J. Abbott. Wiley-Interscience, New York, 1973. xvi, 320 pp. $12.95.

Cytology of the Female Genital Tract. G. Riotton and W. M. Christopherson in collaboration with R. Lunt. World Health Organization, Geneva, 1973 (U.S. distributor, American Public Health Association, Washington, D.C.). 44 pp. + plates. $18; with transparencies, $50. International Histological Classification of Tumours, No. 8.

Deposition and Corrosion in Gas Turbines. Proceedings of a conference, London, Dec. 1972. A. B. Hart and A. J. B. Cutler, Eds. Halsted (Wiley), New York, 1973. xviii, 426 pp., illus. $47.50.

Does College Matter? Some Evidence on the Impacts of Higher Education. Proceedings of a conference, Woods Hole, Mass., July 1972. Lewis C. Solmon and Paul J. Taubman, Eds. Academic Press, New York, 1973. xx, 416 pp., illus. $14.95.

Dynamics in Engineering Structures. Vladimir Kolousek. Translated from the Czech. R. F. McLean and J. F. Fleming, Eds. Halsted (Wiley), New York, 1973. 580 pp., illus. + charts. $39.95.

Earthquakes. Spectral Analysis and Characteristics of Accelerograms as a Basis of Earthquake-Resistant Design. Raul Husid. Bello, Santiago, Chile, 1973. 448 pp., illus. Paper, $15.

Economics and the Public Purpose. John Kenneth Galbraith. Houghton Mifflin, Boston, 1973. xvi, 334 pp. $10.

Egyptian Religion. Siegfried Morenz. Translated from the German edition (Stuttgart, 1960) by Ann E. Keep. Cornell University Press, Ithaca, N.Y., 1973. xiv, 380 pp. $19.50.

Electronics for Neurobiologists. Paul Brown, Bruce W. Maxfield, and Howard Moraff. MIT Press, Cambridge, Mass., 1973. xii, 544 pp., illus. $19.95.

Emotion in Man and Animal. Its Nature and Dynamic Basis. Paul Thomas Young. Krieger, Huntington, N.Y., ed. 2, 1973. xvi, 480 pp., illus. $14.95.

Engineering Education. A Social History. George S. Emmerson. David and Charles, Newton Abbot, England, and Crane, Russak, New York, 1973. 384 pp. $16.25.

Evolutionary Paleoecology of the Marine Biosphere. James W. Valentine. Prentice-Hall, Englewood Cliffs, N.J., 1973. xvi, 512 pp., illus. $16.95.

Experimental Embryology of Echinoderms. Sven Hörstadius. Clarendon (Oxford University Press), New York, 1973. x, 192 pp., illus. $16.

Exploring Minerals and Crystals. Robert I. Gait. Photographs by Arthur Williams.

McGraw-Hill, New York, 1973. 120 pp. $7.95.

Fertility Control Methods. Strategies for Introduction. Proceedings of a workshop, Seattle, Wash., Dec. 1972. Gordon W. Duncan, Elizabeth J. Hilton, Philip Kreager, and Arthur A. Lumsdaine, Eds. Academic Press, New York, 1973. xviii, 230 pp. $7.50.

Findlay's Practical Physical Chemistry. Revised and edited by B. P. Levitt. Halsted (Wiley), New York, ed. 9, 1973. xxii, 442 pp., illus. $11.75.

Fixation in Histochemistry. P. J. Stoward, Ed. Chapman and Hall, London, 1973 (U.S. distributor, Halsted [Wiley], New York). xii, 202 pp., illus. $16. Reprinted from *The Histochemical Journal*, vols. 4 and 5.

Foundations of Futurology in Education. Richard W. Hostrop, Ed. ETC Publications, Homewood, Ill., 1973. vi, 250 pp. $7.95.

Foundations of the Thermodynamic Theory of Generalized Fields. Essays in Natural Philosophy. Mahmoud A. Melehy. Mono Book, Baltimore, 1973. xxii, 256 pp., illus. $15.

Fourier Transforms of Distributions and Their Inverses. A Collection of Tables. Fritz Oberhettinger. Academic Press, New York, 1973. xii, 168 pp. $18. Probability and Mathematical Statistics, vol. 16.

Free Radicals. Vol. 2. Jay K. Kochi, Ed. Wiley-Interscience, New York, 1973. xxii, 906 pp., illus. $42.50. Reactive Intermediates in Organic Chemistry.

From Diagnosis to Treatment. An Approach to Treatment Planning for the Emotionally Disturbed Child. Vol. 8, No. 87. Formulated by the Committee on Child Psychiatry. Group for the Advancement of Psychiatry, New York, 1973. pp. 517–662. Paper, $4.

Fundamental and Applied Laser Physics. Proceedings of a symposium, Esfahan, Iran, Aug. 1971. Michael S. Feld, Ali Javan, and Norman A. Kurnit, Eds. Wiley-Interscience, New York, 1973. xiv, 952 pp., illus. $27.50.

Gas Chromatography—Mass Spectrometry in Neurobiology. E. Costa and B. Holmstedt, Eds. Raven, New York, 1973. viii, 176 pp., illus. $15.95. Advances in Biochemical Psychopharmacology, vol. 7.

La Génétique de l'Intelligence. Jacques Larmat. Presses Universitaires de France, Paris, 1973. 192 pp., illus. Paper, 18F. Collection SUP.

Geowriting. A Guide to Writing, Editing, and Printing in Earth Science. Wendell Cochran, Peter Fenner, and Mary Hill, Eds. American Geological Institute, Washington, D.C., 1973. 80 pp., illus. Paper, $3. GEGS Programs Publication 17.

Gravitation. Charles W. Misner, Kip S. Thorne, and John Archibald Wheeler. Freeman, San Francisco, 1973. xxx, 1280 pp., illus. Cloth, $39.50; paper, $19.95.

The Growth of Crystals from Liquids. J. C. Brice. North-Holland, Amsterdam, and Elsevier, New York, 1973. xiv, 380 pp., illus. $31. Series of Monographs on Selected Topics in Solid State Physics 12.

Habituation. Harman V. S. Peeke and Michael J. Herz, Eds. Academic Press, New York, 1973. 2 vols, illus. Vol. 1, Behavioral Studies. xii, 290 pp. $15. Vol. 2, Physiological Substrates. xii, 216 pp. $22.50.

Hadron Physics at Very High Energies. David Horn and Fredrik Zachariasen. Benjamin, Reading, Mass., 1973. xviii, 378 pp., illus. Cloth, $17.50; paper, $9.50. Frontiers in Physics.

The Hammett Equation. C. D. Johnson. Cambridge University Press, New York, 1973. viii, 196 pp., illus. $13.50. Cambridge Chemistry Texts.

Handbook of Environmental Control. Richard G. Bond, Conrad P. Straub, and Richard Prober, Eds. CRC Press, Cleveland, Ohio, 1973. Two volumes, illus. Vol. 1, Air Pollution. x, 576 pp. $36. Vol. 2, Solid Waste. x, 580 pp. $31.

Harmonic Analysis on Homogeneous Spaces. Nolan R. Wallach. Dekker, New York, 1973. xx, 362 pp. $24.75. Pure and Applied Mathematics, vol. 19.

The Head, Neck, and Trunk. Muscles and Motor Points. John H. Warfel. Lea and Febiger, Philadelphia, ed. 4, 1973. 128 pp., illus. $4.75.

Housing Urban America. Jon Pynoos, Robert Schafer, and Chester W. Hartman, Eds. Aldine, Chicago, 1973. x, 598 pp. + plates. $25.

Imprinting. Early Experience and the Developmental Psychobiology of Attachment. Eckhard H. Hess. Van Nostrand Reinhold, New York, 1973. xvi, 472 pp., Illus. $19.50. Behavioral Science Series.

Inborn Errors of Metabolism. Proceedings of a symposium, Warffum, The Netherlands, 1972. F. A. Hommes and C. J. Van Den Berg, Eds. Academic Press, New York, 1973, xvi, 376 pp., illus. $19.75.

Industrial Gums. Polysaccharides and Their Derivatives. Roy L. Whistler and James N. BeMiller, Eds. Academic Press, New York, ed. 2, 1973. xii, 808 pp., illus. $45.

Institution Building in India. A Study of International Collaboration in Management Education. Thomas M. Hill, W. Warren Haynes, and Howard Baumgartel, with the collaboration of Samuel Paul. Harvard University Graduate School of Business Administration, Boston, 1973. xvi, 382 pp. $10.

The International Encyclopedia of Cats. G. N. Henderson and D. J. Coffey, Eds. Photographs by Anne Cumbers; drawings by Annabel Milne. McGraw-Hill, New York, 1973. 256 pp. + plates. $17.95.

International Review of Cytology. Vol. 35. G. H. Bourne, J. F. Danielli, and K. W. Jeon, Eds. Academic Press, New York, 1973. x, 372 pp., illus. $23.50.

Introduction to Behavioral Genetics. G. E. McClearn and J. C. DeFries. Freeman, San Francisco, 1973. x, 350 pp., illus. $10. A Series of Books in Psychology.

Introduction to Electron and Ion Optics. Poul Dahl. Academic Press, New York, 1973. viii, 148 pp., illus. $10.50.

An Introduction to Financial Control and Reporting in Multinational Enterprises. Graduate School of Business, University of Texas, Austin, 1973. xii, 90 pp. Paper, $1. Studies in International Business No. 1. Reprinted from the *1973 Supplement to the Accounting Review.*

An Invitation to Cognitive Psychology. W. Lambert Gardiner. Brooks/Cole (Wadsworth), Monterey, Calif., 1973. x, 180 pp. Paper, $4.95.

Kuyo Chico. Applied Anthropology in an Indian Community. Oscar Nunez del Prado with the collaboration of William Foote Whyte. Translated by Lucy Whyte Russo and Richard Russo. University of Chicago Press, Chicago, 1973. xvi, 162 pp., illus. $9.50.

Laser Devices and Applications. A Book of Selected Reprints. Ivan P. Kaminow and Anthony E. Siegman, Eds. IEEE Press, New York, 1973 (distributor, Wiley, New York). viii, 496 pp., illus. Cloth, $14.95; paper, $7.50.

Liberal America and the Third World. Political Development Ideas in Foreign Aid and Social Science. Robert A. Packenham. Princeton University Press, Princeton, N.J., 1973. xxii, 396 pp. $15.

Life beyond Earth and the Mind of Man. Proceedings of a symposium, Boston, Nov. 1972. Richard Berendzen, Ed. National Aeronautics and Space Administration, Washington, D.C., 1973 (available as NASA SP-328 from the Superintendent of Documents, Washington, D.C.). viii, 106 pp., illus. Paper, $1.

Man against Tsetse. Struggle for Africa. John J. McKelvey, Jr. Cornell University Press, Ithaca, N.Y., 1973. xviii, 306 pp., illus. $12.50.

Marine Aquarium Keeping. The Science, Animals, and Art. Stephen Spotte. Wiley-Interscience, New York, 1973. xviii, 172 pp., illus. + plates. $9.95.

Mathematical Models and Applications. With Emphasis on the Social, Life, and Management Sciences. Daniel P. Maki and Maynard Thompson. Prentice-Hall, Englewood Cliffs, N.J., 1973. xviii, 492 pp., illus. $14.95.

The Mathematics of Collective Action. James Coleman. Aldine, Chicago, 1973. x, 192 pp., illus. $9.75. Methodological Perspectives.

Media Utilization and Needs in Physician's Assistant Programs and Medical-Health Education. D. Robert Howard, Saul H. Jacobs, and David E. Lewis. Association of American Medical Colleges, Washington, D.C., 1973. viii, 78 pp. Paper, $2.50.

Microwave Semiconductor Devices. Fundamentals and Radiation Effects. R. J. Chaffin. Wiley-Interscience, New York, 1973. xii, 388 pp., illus. $22.50.

Mineral Deposits. Origin, Evolution, and Present Characteristics. J. H. Tatsch. Tatsch Associates, Sudbury, Mass., 1973. vi, 264 pp., illus. $64.

Minnesota Symposia on Child Psychology. Vol. 7. Minneapolis, Oct. 1972. Anne D. Pick, Ed. University of Minnesota Press, Minneapolis, 1973. x, 214 pp., illus. $8.75.

Molecular Biology of Plants. A Text-Manual. Joe H. Cherry. Columbia University Press, New York, 1973. xii, 204 pp., illus. $12.

Neurochemistry of Cerebral Electroshock. Walter B. Essman. Spectrum, Flushing, N.Y., 1973 (distributor, Halsted [Wiley], New York). viii, 182 pp., illus. $12.50. Monographs in Modern Neurobiology.

Numerical Analysis. A. M. Cohen, J. F. Cutts, R. Fielder, D. E. Jones, J. Ribbans, and E. Stuart. Halsted (Wiley), New York, 1973. xiv, 342 pp., illus. $10.75.

Problems for a Computer-Oriented Calculus Course. With an Appendix on Elementary Fortran Programming. Richard C. Allen, Jr., and G. Milton Wing. Prentice-Hall, Englewood Cliffs, N.J., 1973. xvi, 206 pp., illus. Paper, $3.50.

Proceedings of a Colloquium on the Winter Hardiness of Cereals. Martonvásár, Hungary, Oct. 1972. Sandor Rajki, Ed. Agricultural Research Institute of the Hungarian Academy of Sciences, Martonvásár, Hungary, 1972. ii, 222 pp., illus. Paper.

Proceedings of the 11th International Conference on the Physics of Semiconductors. Warsaw, Poland, July 1972. Elsevier, New York, and Polish Scientific Publishers, Warsaw, Poland, 1973. Two volumes, illus. Vol. 1, pp. 1–782. Vol. 2, pp. 783–1514. $72.

The Process of Psychotherapy. Empirical Foundations and Systems Analysis. Donald J. Kiesler. Aldine, Chicago, 1973. xxiv, 464 pp. $15. Modern Applications of Psychology.

Professors, Unions, and American Higher Education. Everett Carll Ladd, Jr., and Seymour Martin Lipset. American Enterprise Institute for Public Policy Research, Washington, D.C., 1973. xii, 124 pp. Paper, $1.75. Domestic Affairs Study, 16.

Progress in Surface and Membrane Science. Vol. 7. J. F. Danielli, M. D. Rosenberg, and D. A. Cadenhead, Eds. Academic Press, New York, 1973. xvi, 334 pp., illus. $24.50.

Propagators in Quantum Chemistry. Jan Linderberg and Yngve Öhrn. Academic Press, New York, 1973. viii, 152 pp., illus. $9.50. Theoretical Chemistry, vol. 3.

Properties of Materials for Electrical Engineers. K. J. Pascoe. Wiley, New York, 1973. xii, 324 pp., illus. $15.95.

Psycholinguistics and Aphasia. Harold Goodglass and Sheila Blumstein, Eds. Johns Hopkins University Press, Baltimore, 1973. vi, 346 pp., illus. $12.50.

The Psychology of Learning and Motivation. Advances in Research and Theory. Vol. 7. Gordon H. Bower, Ed. Academic Press, New York, 1973. xiv, 370 pp., illus. $19.50.

Psychopathology and Pictorial Expression. An International Iconographical Collection. Vol. 3, Series 13–18. Karger, Basel, Switzerland, 1973 (U.S. distributor, Phiebig, White Plains, N.Y.). 41 pp. + plates. Unbound, boxed, $57.50.

Quantum Mechanics. New Approaches to Selected Topics. Harry J. Lipkin. North-Holland, Amsterdam, and Elsevier, New York, 1973. xvi, 465 pp., illus. $37.50.

Quantum Statistical Properties of Radiation. William H. Louisell. Wiley, New York, 1973. xvi, 528 pp. $27.50. Wiley Series in Pure and Applied Optics.

Queueing Theory in OR. E. Page. Crane, Russak, New York, 1972. 188 pp., illus. $11. Operational Research Series.

The Rand McNally Atlas of World Wildlife. Rand McNally, New York, in association with Beazley, London, 1973. 208 pp. $25.