SCIENCE 22 September 1972
Vol. 177, No. 4054
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

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22 September 1972
Vol. 177, No. 4054

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COVER

Ciliated and nonciliated epithelial cells from hamster trachea. Mucus droplets are supported by the cilia (about × 7700). See page 1105. [Curtis Port and Irene Corvin, Illinois Institute of Technology Research Institute, Chicago]

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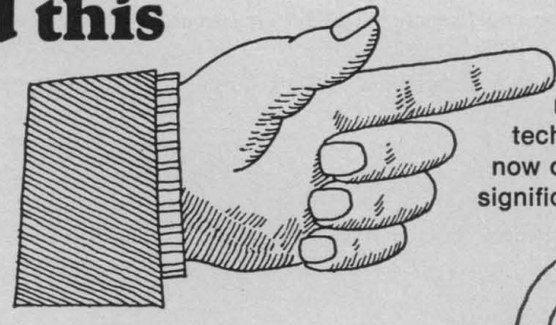

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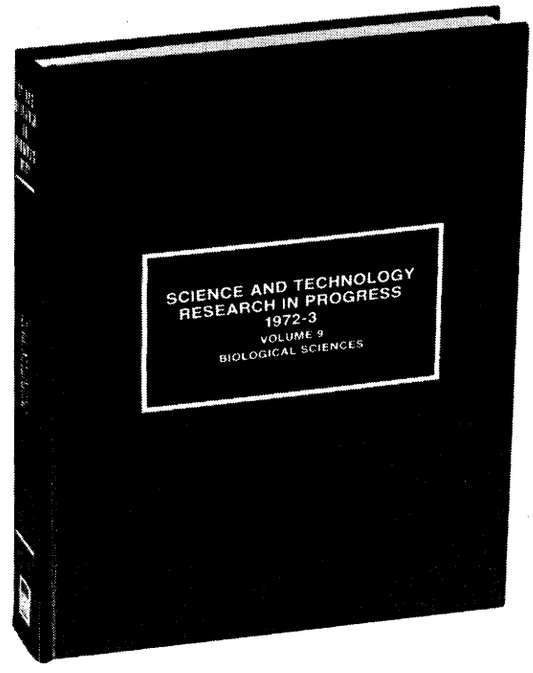

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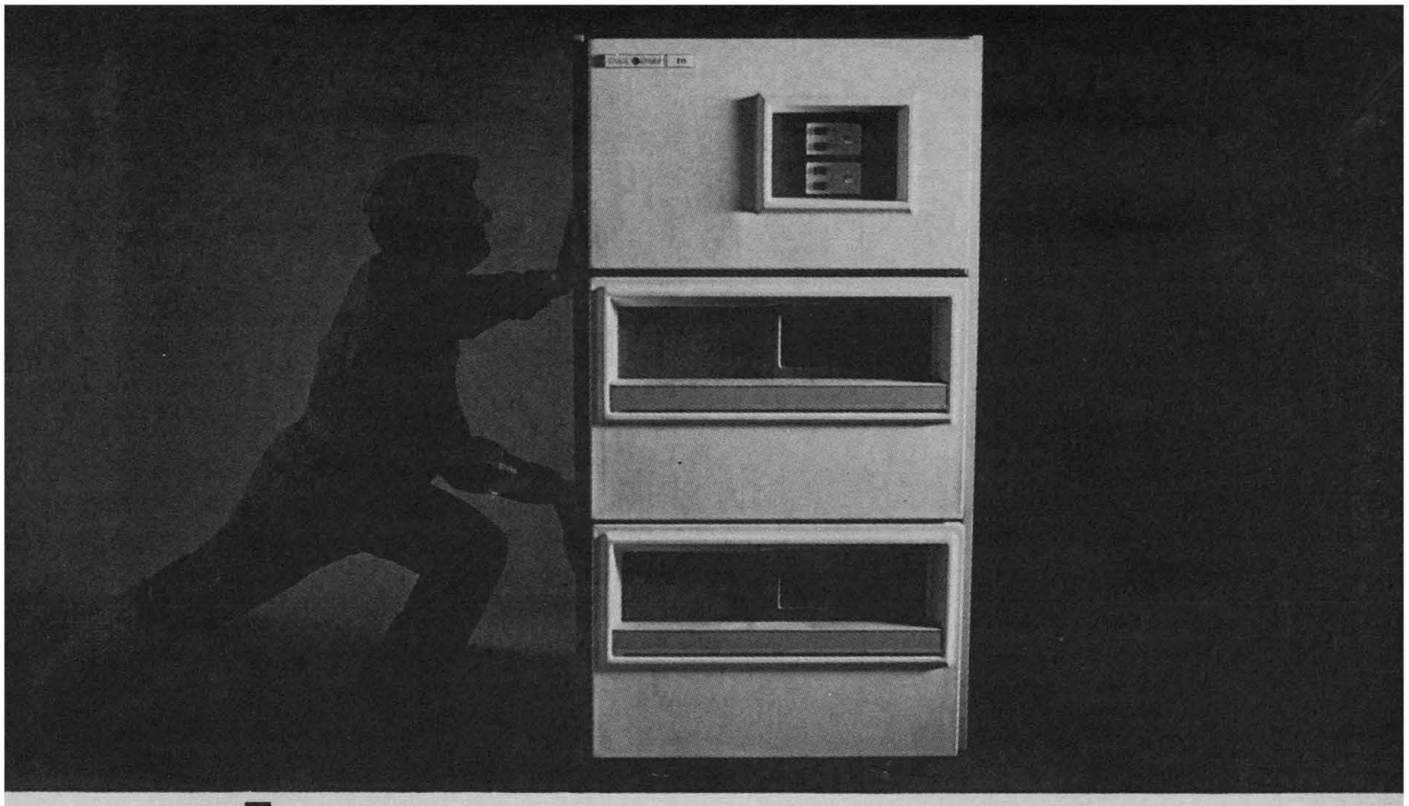

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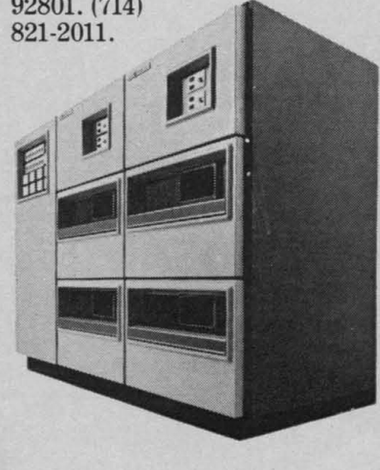

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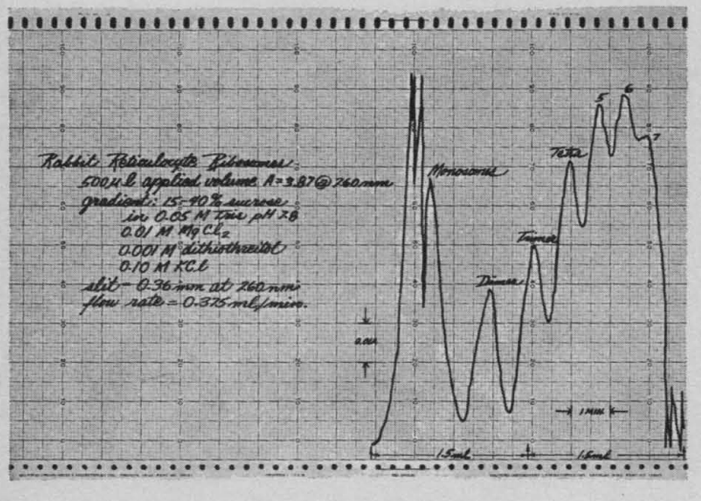

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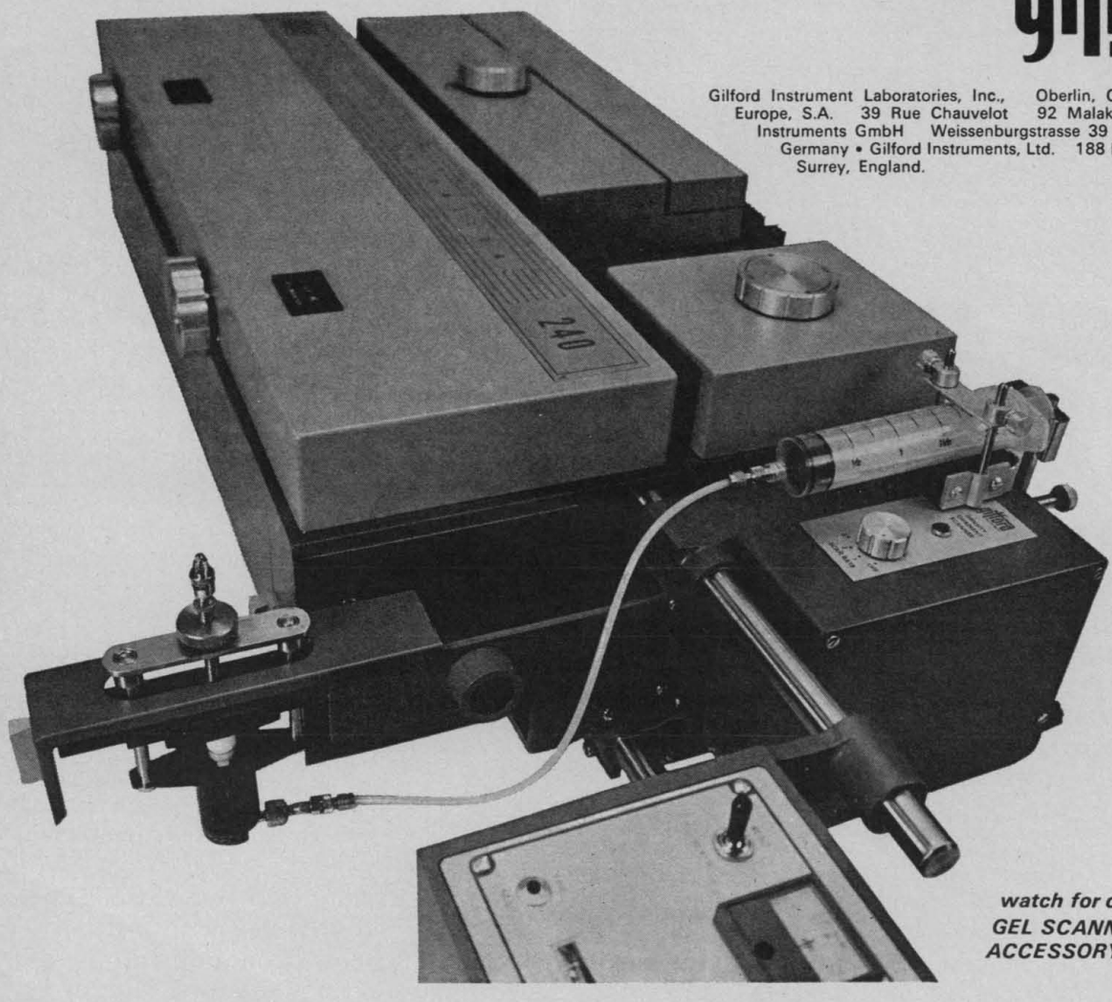

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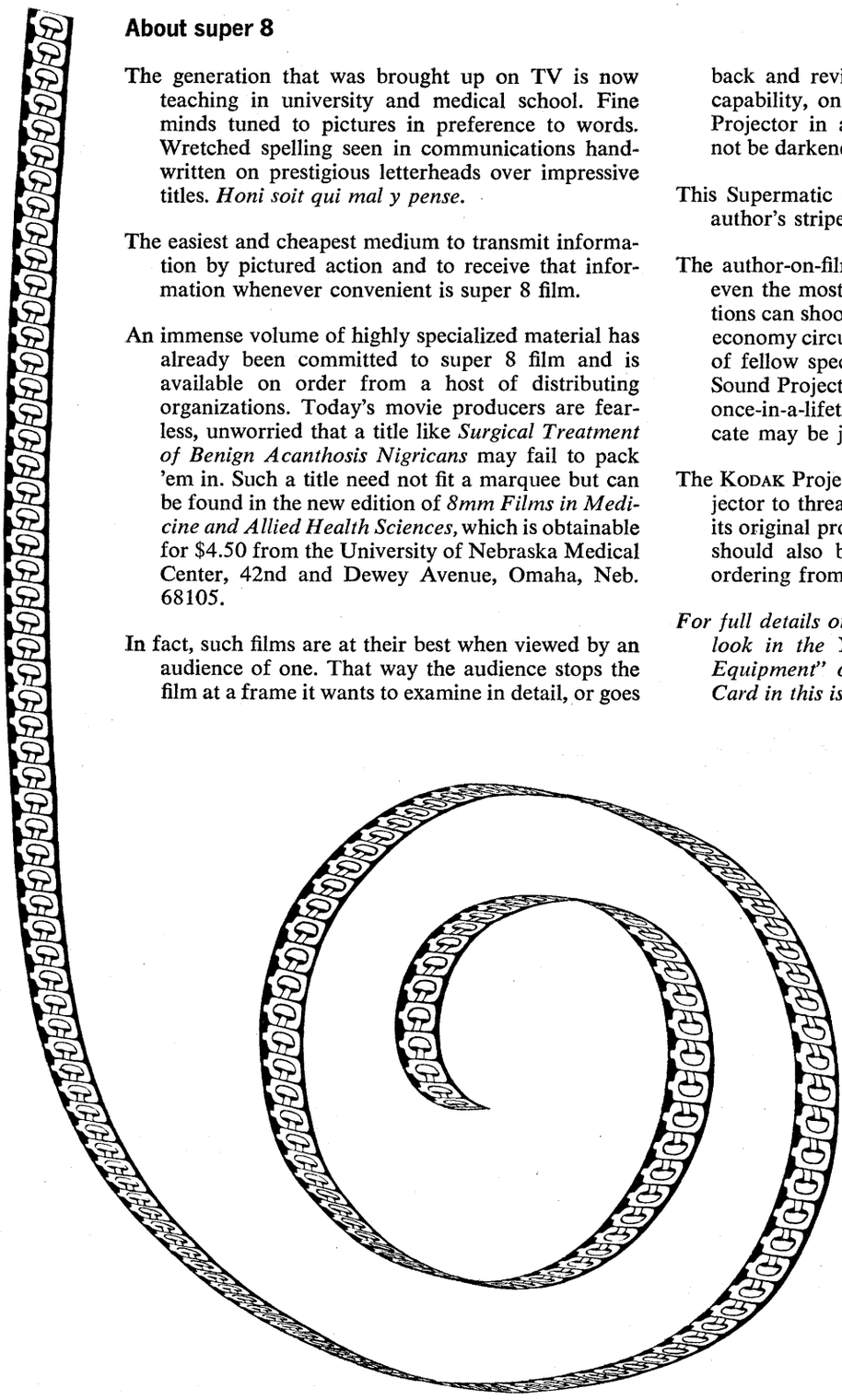

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THE NEW CARWORTH CATALOGS

MYTH OR REALITY?

In the course of this newspaper's investigations into the new Carworth guinea pigs, our reporters have also uncovered the fact that Carworth is about to release two new catalogs.

The first of these catalogs presumably deals with Carworth rats and mice and, we suspect, the "secret" guinea pigs, too.

The second catalog seems to cover Carworth's extensive line of laboratory animal care equipment including: animal housing systems, contamination control products like laminar flow devices, bedding, cleaning materials and other accessories and supplies.

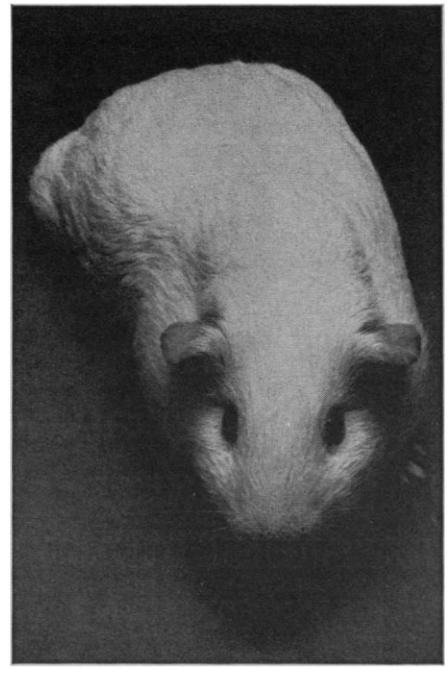
We queried the Carworth advertising agency about the existence of these new catalogs and were told by a representative that they know nothing (Editor's Note: an unusual agency admission!), but that if Carworth *were* to issue new catalogs soon, "they would be likely to be beauties," they stated with characteristic immodesty.

The New City Times can't help but wonder what other surprises these Carworth people have in store for us. In any event, for now we suggest that you write Carworth, New City, (Rockland County), N.Y. 10956 (or call 914/634-8931) and say: "if these new catalogs are not a myth, please send!"

CARWORTH INTO GUINEA PIGS

RESEARCH COMMUNITY PLEASED

Surprisingly, Company Says "No Comment"



The guinea pig, believed to be a tame form of the cavy, *Cavia cutleri*. The capybara, the largest rodent alive (or even dead, for that matter), is also a well-known cavy.

The New City Times today learned from an unidentified but usually reliable source, that Carworth, a leading supplier of high quality rats and mice since 1935, has expanded its service to the research community by adding guinea pigs to its line.

Calls by this newspaper to a random selection of research people indicate that the guinea pig, always a popular animal for bacteriologic and vitamin C work, is now also being widely used in immunologic, pharmacologic, virologic, and endocrinologic studies of all types.

Thus, it seems obvious to this paper that the entry into this field of a quality house like Carworth provides researchers with a valuable new source for this important laboratory animal.

Our investigative reporters have also uncovered the fact that the Carworth guinea pigs are actually Dunkin/Hartley animals from a closed colony meticulously maintained for over 15 years.

Carworth personnel have routinely responded to our inquiries about this development with enigmatic smiles and "no comment" and will neither affirm nor deny any of the above allegations.

Despite this uncharacteristic reticence, our reporters are firm in their conviction that all researchers interested in Carworth-quality guinea pigs are entitled to know more. The New City Times suggests, therefore, that interested parties demand more data. Write CIA (Carworth Information Agency), c/o Carworth, New City, (Rockland County), New York, 10956 (or call 914/634-8931). They'll get the message.

Rats and Mice by the Thousands

THOSE OTHER CARWORTH ANIMALS

Surreptitious investigation of the multiple Carworth facilities indicates that the company's apparent entry into guinea pigs has in no way diminished their activity in—or apparent enthusiasm for—supplying researchers with quality rats and mice.

Carworth mice include the well-known CF 1, CFW, and BALB/c CF inbred strain. The Carworth rats are the widely-used CFN and CFE strains.

Rumor also has it that Carworth supplies researchers with surgically-modified mice and rats at prices far below that which can be achieved by the purchaser in his own institution. (Can that be?)

The New City Times has learned that if you write to Carworth, New City, (Rockland County), New York 10956 (or call 914/634-8931) and ask for further information on their rats and mice, you'll get it.

Below is a list of suggested titles of reprints. We can supply reprints of these or of any other articles which have appeared in Science during the past six years in minimum quantities of twenty-five copies. Allow six weeks for delivery of reprints not marked with an asterisk. (Numbers in parentheses indicate number of pages for each reprint.)

BIOLOGY AND SOCIAL PROBLEMS

1) D. Alpert and D. L. Bitzer, "Advances in Computer-Based Education," 20 March 1970 (12)
*2) R. C. Atkinson and H. A. Wilson, "Computer-Assisted Instruction," 4 Oct. 1968 (8)
3) J. H. U. Brown and J. F. Dickson III, "Instrumentation and the Delivery of Health Services," 17 Oct. 1969 (8)
*4) A. J. Coale, "Man and His Environment," 9 Oct. 1970 (8)
*5) A. Crancer, Jr., *et al.*, "Comparison of the Effects of Marihuana and Alcohol on Simulated Driving Performance," 16 May 1969 (4)
*6) B. D. Davis, "Prospects for Genetic Intervention in Man," 18 Dec. 1970 (8)
7) B. D. Dinman, " 'Non-Concept' of 'No-Threshold': Chemicals in the Environment," 4 Feb. 1972 (4)
*8) N. I. Dishotsky *et al.*, "LSD and Genetic Damage," 30 April 1971 (2)
9) L. L. Heston, "The Genetics of Schizophrenic and Schizoid Disease," 16 Jan. 1970 (8)
*10) C. Holden, "Community Health Centers: Growing Movement Seeks Identity, Storefront Therapy and More," 10 and 17 Dec. 1971 (8)
*11) L. E. Hollister, "Marihuana in Man: Three Years Later," 2 April 1971 (8)
12) L. R. Kass, "The New Biology: What Price Relieving Man's Estate?," 19 Nov. 1971 (12)
13) L. Lasagna, "The Pharmaceutical Revolution: Its Impact on Science and Society," 5 Dec. 1969 (8)
14) W. McDermott *et al.*, "Health Care Experiment at Many Farms," 7 Jan. 1972 (12)
*15) L. Marx, "American Institutions and Ecological Ideals," 27 Nov. 1970 (8)
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*18) R. S. Morison, "Science and Social Attitudes," 11 July 1969 (8)
19) R. S. Morison, "Death: Process or Event?," and L. R. Kass, "Death as an Event: A Commentary on Robert Morison," 20 Aug. 1971 (12)
*20) E. Rubin and C. S. Lieber, "Alcoholism, Alcohol, and Drugs," 11 June 1971 (8)
*21) S. Scarr-Salapatek, "Race, Social Class, and IQ," 24 Dec. 1971 (12)
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*27) A. J. Coale, "Man and His Environment," 9 Oct. 1970 (8)
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*32) M. I. Goldman, "The Convergence on Environmental Disruption," 2 Oct. 1970 (8)
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risk infants who are known to have positive signs of motor dysfunction. Stimulating the walking and placing reflexes of some infants with cerebral palsy might improve their eventual mobility development, although this is only conjecture.

EDWARD EARL GOTTS
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Illingworth correctly notes that extending the infant's head backward produces walking movements at and beyond age 8 weeks. We controlled the posture of the head in both training and testing sessions; the infant's head was tilted slightly forward or held erect voluntarily, but never deliberately extended backward. Moreover, we explored this procedure with three 8-week-old control infants and found it difficult to elicit more than three or four steps in a 1-minute session. Infants in the active-exercise group elicited as many as 43 steps in the same period.

Gotts admonishes that it is the motor scale, not the mental scale, of infant development that is predicated on the assumption of an invariant motor sequence, but he overlooks the relation between the scales; they are not independent. Bayley herself reports ". . . a substantial positive correlation, usually of the order of .50 to .60, between the Mental and Motor Scales, in approximately the first twelve months of life . . ." (*1*). "Reaches for dangling ring at 3.1 months" is explicitly listed as a motor-related mental item, for example. The direction of the relation is also clear. Bayley explains that, "The development of manipulatory skills, which is seen most clearly in infancy, facilitates the development and employment of the various basic mental processes" (*1*). The assumption of an invariant motor sequence, therefore, also underlies a substantial portion of the mental scale.

The earlier walking established in our active-exercise group (mean of 10 months), although statistically significant, was within the range of normal development—about 9 to 18 months (*2*). Yet, Gotts expresses concern about the relation of early walking to accidental injury. We share his concern about childhood accidents but find much of his argument irrelevant to research on newborn walking. It is unreasonably fear-provoking and inaccurate to imply that walking in newborns is related to the ". . . more than 30 percent of children under 5 years" who "are injured annually. . . ." For example, he fails to differentiate the category of "falls" from that of "accidents" in general, which includes mortalities caused by motor vehicles (the most frequent agent nationally for children age 1 to 4), burns, drowning, poisons, and suffocation—the most frequent cause of death under age 1 (*3*). All falls are not the result of walking; this category also includes falls that occur when infants are crawling on stairs, porches, and furniture. Gotts overlooks one relevant study that specifically examined the role of early motor acquisition in accident- and nonaccident-prone children and found ". . . no gross differences . . ." between the groups (*3*). Accidents occur most often when children are unsupervised (*4*), and it seems more likely that the prevention of accidents will come with safer environments and closer supervision than from avoiding early walking.

We explicitly instructed parents to never *force* their infants to walk, on the belief that forcing any number of responses (eating or toilet training, for example) may be harmful. Infants are well equipped to express their displeasure, so it is noteworthy that, for the majority of experimental infants, standing and walking reliably inhibited, rather than caused, distress.

We tried to remove questions about infant walking from the realm of conjecture and include them in the domain of scientific inquiry. Not only is there no convincing evidence from our research or from other observations that deleterious consequences result from early exercise, but those cases that were followed reveal better-than-average motor performance. We emphasized that there


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are many uncontrolled factors in follow-up observations, and the following cases do not demonstrate a causal relation.

Our initial pilot baby, who received active exercise of the walking reflex and opportunities for motor activity beyond the first 8 weeks, walked alone at 7½ months of age. He is now 6 years old and in excellent physical and intellectual condition. He has always showed good coordination—maneuvering a marble with a hockey stick at 14 months and riding a two-wheel bicycle with training wheels at 3½ years of age, for example. He combined as many as three words at 11 months and learned to read and write at 4 years of age. His thorough medical examinations have confirmed his sound physical and intellectual development.

Enough attention has not been given to McGraw's (*5*) pioneering research on Jimmy and Johnny, which included active exercise of the walking response during the newborn period and extensive training thereafter. She reported that Johnny performed more stepping actions as an infant than Jimmy or any of the other controls (*5*). Johnny did not walk sooner but showed ". . . greater agility and control . . ." as an infant (*5*, p. 86) and ". . . superior motor coordination . . ." at 6 years of age (*6*). X-rays of Johnny's legs showed that his skeletal growth at 32 months was normal (*5*). The boys were followed in the laboratory for 10 years, and no deleterious effects associated with early exercise were uncovered.

We have discovered some parents who on their own initiative have permitted their babies to walk and stand during the newborn period. One such parent reports that her three well-built babies walked alone at 7, 9, and 11 months. She described them as exceptionally independent infants, deliberate in their actions, intelligent, and rarely pesty. The children are now in their twenties and in sound health.

In general, Gotts's arguments are more conjectural than substantial, more alarming than accurate. For instance, he notes that children who exhibit reflexes ". . . past the time of their normal disappearance often have associated developmental complications. . . ." Our preliminary observations of active-exercise infants indicate that the Moro, grasp, and rooting reflexes disappear normally. Despite the evidence that walking in the active group at 8 weeks is a learned instrumental response, Gotts assumes that exercise preserves the walking reflex. It is unlikely that the newborn was equipped with reflexes simply to be tested in a neurological examination, although they serve that purpose well. It is possible that the Moro, grasping, walking, placing, and rooting reflexes are vestiges of our past and may have assisted the infant in survival—perhaps by helping him attain proximity to his mother (*7*).

Finally, we want to emphasize that it is not our desire to encourage all parents to walk their newborns, but to encourage more research on newborn walking.

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Graduate Education

Much credit is due Norman Hackerman (Editorial, 4 Feb., p. 475) for tackling some untested dogmas in American academia. It is high time that a serious examination was made of alternative models for graduate education.

Throughout the past two decades, while additions of graduate programs in the most unlikely places were made with the solemn intonation that graduate work and (even mediocre) research were needed to retain or produce the best undergraduate teachers, I asked deans and presidents for any study or evidence that this was true. I repeat my request in your columns. Dozens of small liberal arts colleges—the Wesleyans, Oberlins, Kenyons—managed to

provide excellent undergraduate education without attempting to involve the faculty in formal (funded) research activities.

Far from being synergistic, the combination of undergraduate and graduate programs in the same institution are generally destructive to both. The highest values sought, the parameters for success, and the reward structures that would optimize the two subsystems are in many cases, incompatible, especially in smaller institutions. Obviously there are persons who are good at both, and these exceptions (like Pauling) are cited to prove that the faculty member is helped in his *undergraduate* teaching by his research activity.

It is time to go beyond Hackerman's call for the study of alternatives to experiments with alternatives. Some 4 years ago, as one of (Pennsylvania) Governor Shafer's science advisers, I suggested that he use part of the large sums going into expanding higher education for the development of all kinds of radically new patterns of education. A detailed model was constructed of semi-autonomous "Graduate Colleges of Interdisciplinary (and mission-oriented) Studies." Such colleges, affiliated with a major university, would couple research with graduate teaching and public service only. The ethos, goals, and reward structure would be directed to the best possible graduate (and postdoctoral) training. Operating on the philosophical basis that it is equally blessed to teach a graduate as an undergraduate student, we might have a clean text of the costs and quality of graduate education in a system designed for it alone.

The alleged high cost of graduate education results from accounting devices to average costs. Terman (*1*) has provided data on this point. Given operations of a critical-mass size, selected areas of science, applied science and engineering (including all social science fields), and a reasonably stable federal research picture, zeroth order figures show credit-hour costs near average undergraduate costs (chiefly due to the research subsidy). The tragedy of American graduate education is the total lack of institutional and structural innovation.

RUSTUM ROY

Materials Research Laboratory, Pennsylvania State University, University Park 16802

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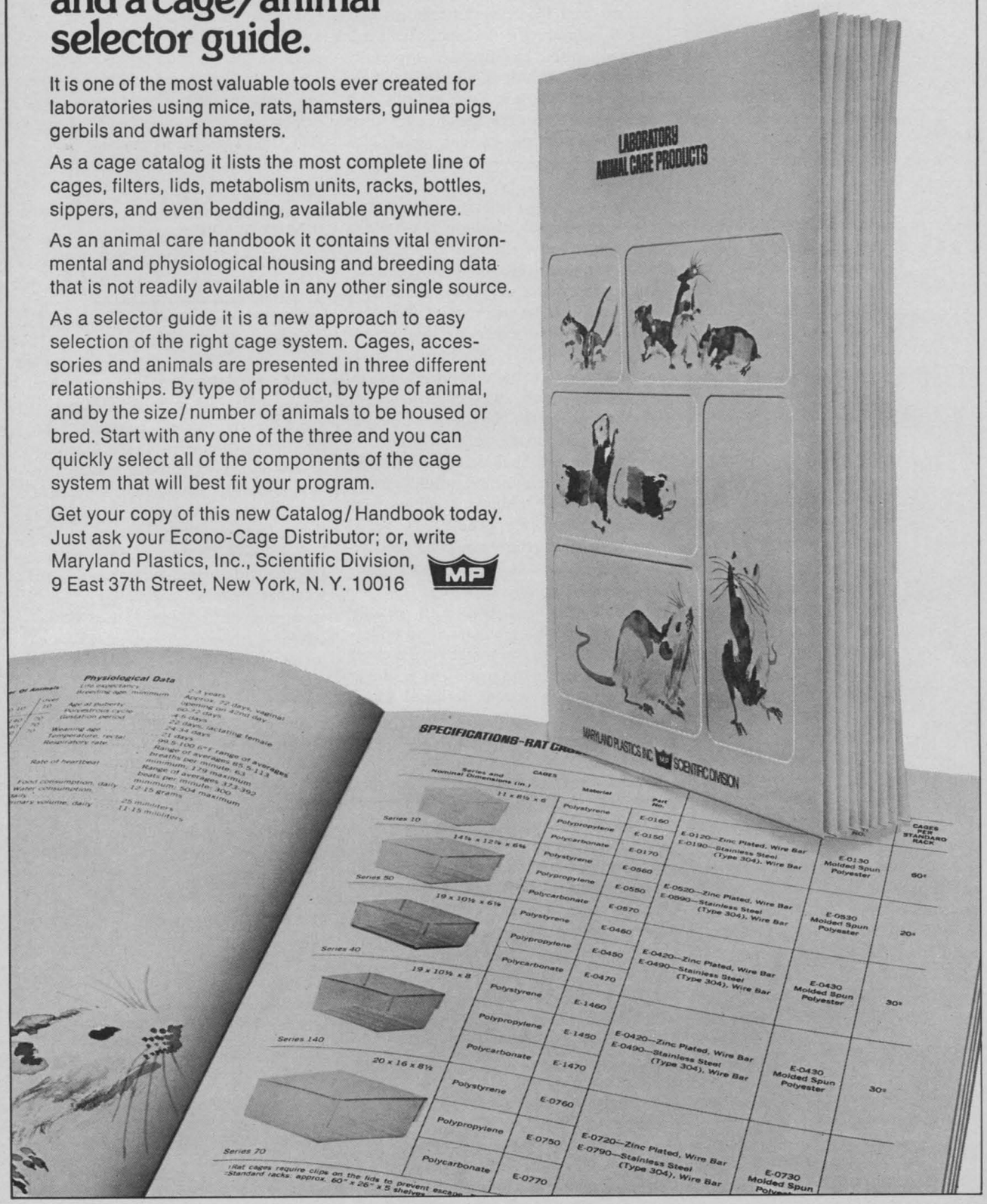

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Mexican President Echeverría and Science

During his recent state visit to the United States, the President of Mexico, Luis Echeverría, graciously met with a delegation from the AAAS at Blair House in Washington, D.C. One purpose of the meeting was to brief him on progress for the inter-American meeting "Science and Man in the Americas," which is being planned jointly by the AAAS and the Consejo Nacional de Ciencia y Tecnología of Mexico (CONACYT). The meeting is scheduled for 17 June to 7 July 1973 (*Science*, 5 November 1971, page 549, and *AAAS Bulletin*, May–June 1972). Another purpose was to invite him to serve as honorary chairman of the meeting, an invitation he was pleased to accept.

What also emerged from the meeting was the portrait of a head of state remarkably aware of the role of science and technology in the life of a nation. Echeverría is alert to the potential of science and technology in helping solve his country's problems and is eager to engage scientists in his councils. It was he, in fact, who created the Consejo in order to foster scientific and technological development in Mexico. His views are well worth quoting here, as reflected in the following excerpts from a recent interview.*

"I believe that the contribution of scientists, both pure and applied, and of technologists is absolutely essential to any country, whatever its level of economic development . . . in Mexico no political decision is taken without the direct or indirect involvement of scientists."

Echeverría understands the differences between political decision-making and scientific advice. "Of course, there will always be a gap between what the scientists and technical men recommend and what the government can do . . . there will always be constraints—for example, budget restrictions and political exigencies—that determine the government's choice between two or more alternatives. I am not suggesting that the political leader is good or bad, no more than I suggest that the scientist can't see beyond his own thesis and proposals; what I mean is that in running a nation many limitations, of time and of place, of financial means, must be taken into account."

Among the major problems now coming under scientific scrutiny in Mexico are pollution of the environment, population and economic growth, and arid zones. "Forty percent of the country is semi-desert land," says Echeverría. "The problems of these dry regions in Mexico, as in the rest of the world, can only be dealt with on a scientific basis."

Not surprisingly, all of these are major topics for consideration at the inter-American meeting next year. Other key areas to be explored then are nutrition, earthquake engineering, nonnuclear energy, the sea and its resources, and science, development, and human values.

Human values concern Echeverría too. "Frequently," he says, "[the inhabitant of urban areas] feels isolated in the midst of a crowd. . . . He loses contact with the mountains, the trees, the sea. . . . I am not being romantic: man, for biological and spiritual reasons, needs his contacts with nature. These are problems associated with the industrial life in all countries, regardless of their political or economic nature."

President Echeverría feels that the opportunities and the problems connected with the wise use of science and technology are of transcending importance to his country. He is delighted to be host to a gathering that will bring together leading scientists from his country, from other parts of Latin America, and from the United States to discuss many of the most interesting of these great challenges.—GLENN T. SEABORG, *President, American Association for the Advancement of Science*

* L. Echeverría, interviewed by B. Friedman, *Impact Sci. Soc.* **22** (No. 1–2), 43 (January–June 1972).

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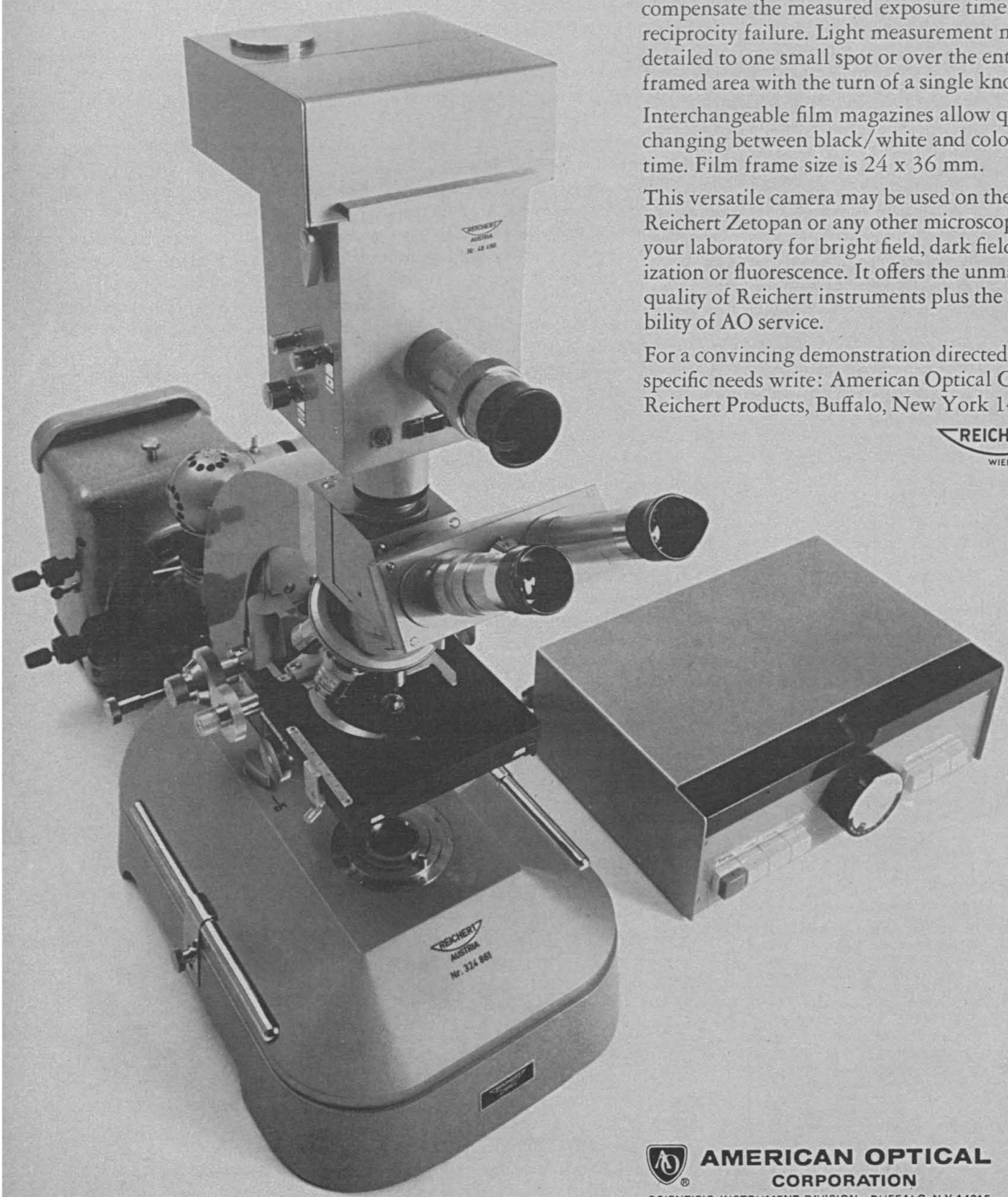

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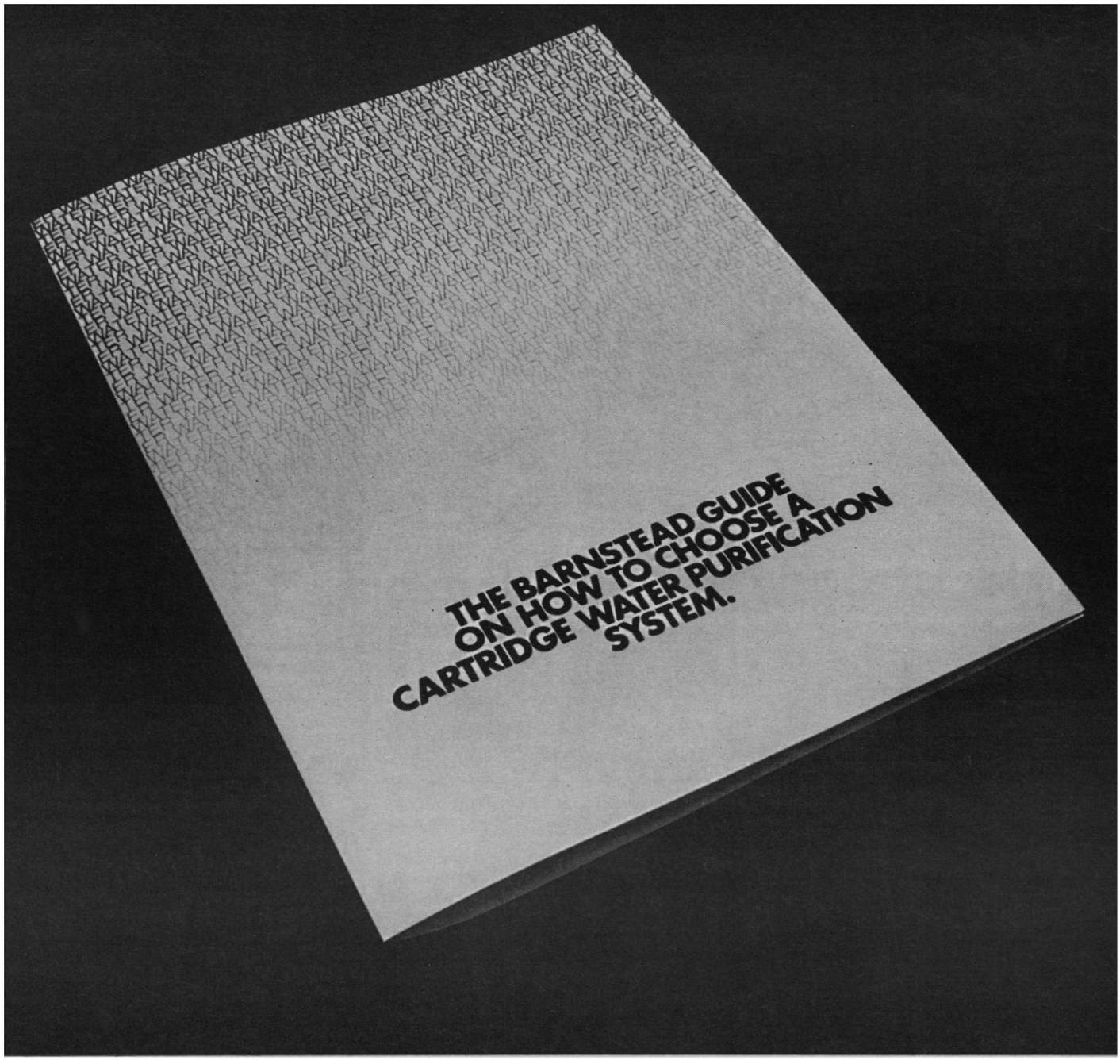

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(*Continued from page 1087*)

tive Institute, to dean, Graduate School of Education, Antioch College. . . . **Stanley Wearden**, chairman, statistics and computer science department, West Virginia University, to dean, Graduate School at the university. . . . **A. Paul Ballantyne**, associate professor of economics, University of Colorado, Colorado Springs, to dean, College of Letters, Arts and Sciences at the university. . . . **John A. Dixon**, professor of surgery, University of Utah, to dean, College of Medicine at the university. . . . **Arthur E. Humphrey**, professor of chemical engineering, University of Pennsylvania, to dean of engineering and applied science at the university. . . . At the University of Wisconsin, Milwaukee: **William F. Halloran**, associate dean, College of Letters and Science, to dean of the college; and **Richmond B. McQuistan**, professor of physics, to dean, Graduate School. . . . **John P. Strain**, associate professor of education, Texas Tech University, to director, School of Education, University of Redlands. . . . **Paul N. Ylvisaker**, professor of public affairs and urban planning, Princeton University, to dean, Graduate School of Education, Harvard University. . . . At Millersville State College: **Edgar R. Thomas**, university dean for graduate education and research, State University of New York, to dean, Graduate School; **Antone K. Fontes**, manager of biological project development, Wyeth Laboratories, to chairman, biology department; and **William A. Pearman**, coordinator of research, Virginia Commonwealth University, to chairman, sociology-anthropology department. . . . **Henry C. Reeves**, professor of microbiology, Arizona State University, to chairman, botany and microbiology department at the university. . . . **Tom K. Scott**, professor of botany, University of North Carolina, Chapel Hill, to chairman, botany department. . . . At the University of South Florida College of Medicine: **Lewis A. Barness**, professor of pediatrics, University of Pennsylvania School of Medicine, to chairman, pediatrics department; **William C. Edwards**, associate professor of ophthalmology, University of Louisville, to chairman, ophthalmology department; and **Herschel Sidransky**, professor of pathology, University of Pittsburgh School of Medicine, to chairman, pathology department. . . . At Lehigh University: **John W. Hunt**, associate dean, Earlham College, to dean, College of Arts and Sciences; and **Richard G. Malsberger**, professor of biology, to chairman, biology department. . . . **Robert B. Sloane**, chairman, psychiatry department, Temple University Health Sciences Center, to chairman, psychiatry department, University of Southern California School of Medicine. . . . **Pablo A. Morales**, acting chairman, urology department, New York University School of Medicine, appointed chairman of the department. . . . At Ohio State University: **Colin B. Bull**, chairman, geology department, to dean, College of Mathematics and Physical Sciences; and **Charles E. Corbató**, professor of geology, to chairman, geology and mineralogy department. . . . **George D. Sorenson, Jr.**, chairman, pathology department, St. Louis University School of Medicine, to chairman, pathology department, Dartmouth Medical School. . . . At University of Florida: **Merle E. Meyer**, chairman, psychology department, Washington State College, to chairman, psychology department; and **George E. Haynam**, professor of systems and information science, Vanderbilt University, to chairman, computer and information sciences department.

RECENT DEATHS

M. Royden C. Astley, 61; professor of psychiatry, School of Medicine, University of Pittsburgh; 7 July.

Solomon A. Berson, 53; director of medicine, Mount Sinai Hospital, and chairman, medicine department, Mount Sinai School of Medicine; 11 April.

Gustav Bychowski, 76; former clinical professor of psychiatry, Downstate Medical Center, State University of New York; 3 April.

Mary L. Caldwell, 81; professor emeritus of chemistry, Cornell University; 1 July.

Benedict Cassen, 69; professor emeritus of biophysics, University of California, Los Angeles; 28 March.

John C. Costello, Jr., 53, director, Thailand Information Center, Battelle Memorial Institute; 12 February.

Frank A. DeCosta, 62; dean, Graduate School, Morgan State College; 19 June.

Jacob W. Dubnoff, 63; adjunct professor, University of Southern California School of Medicine; 30 May.

James H. Fox, 71; professor emeritus of education, George Washington University; 25 June.