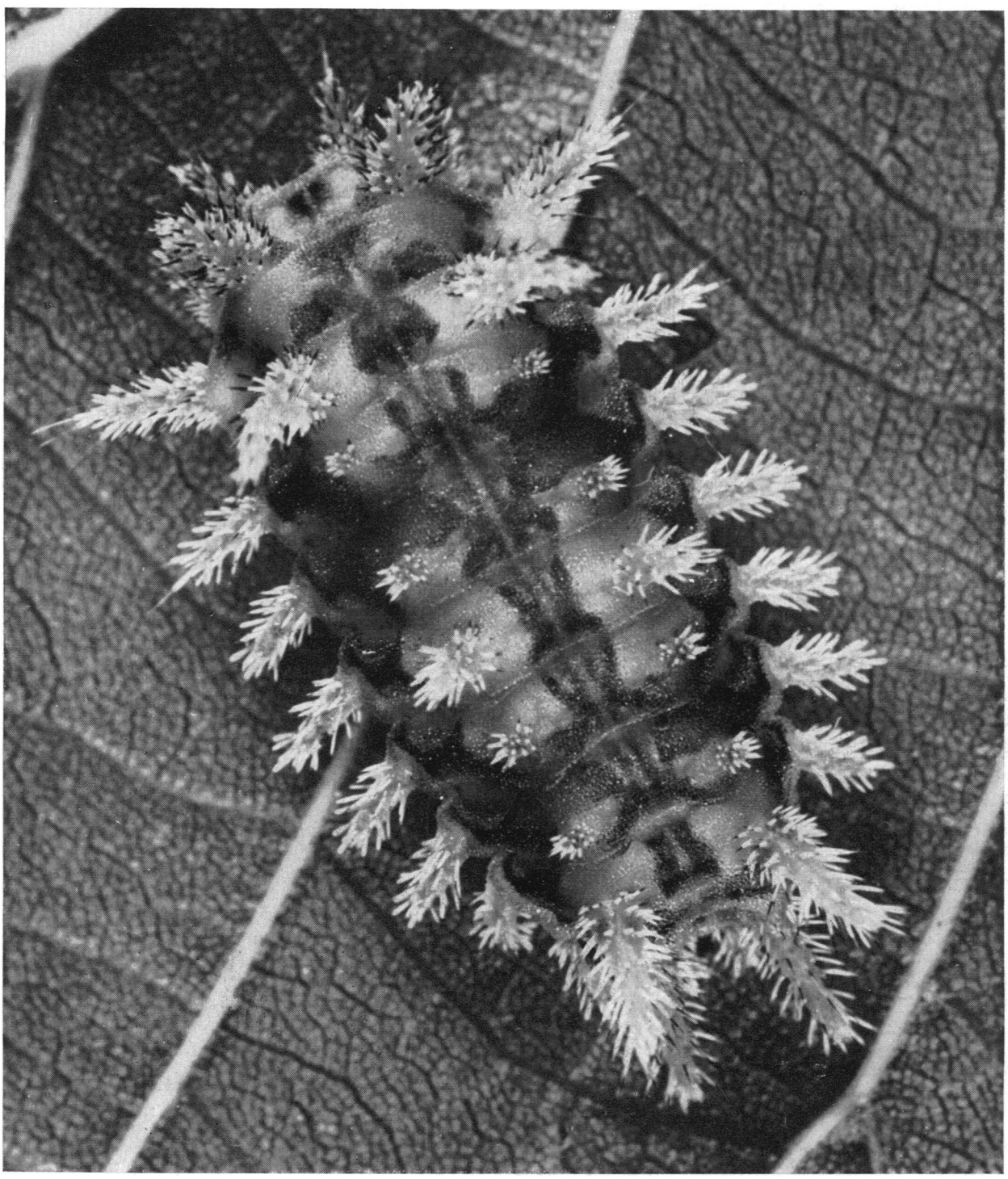
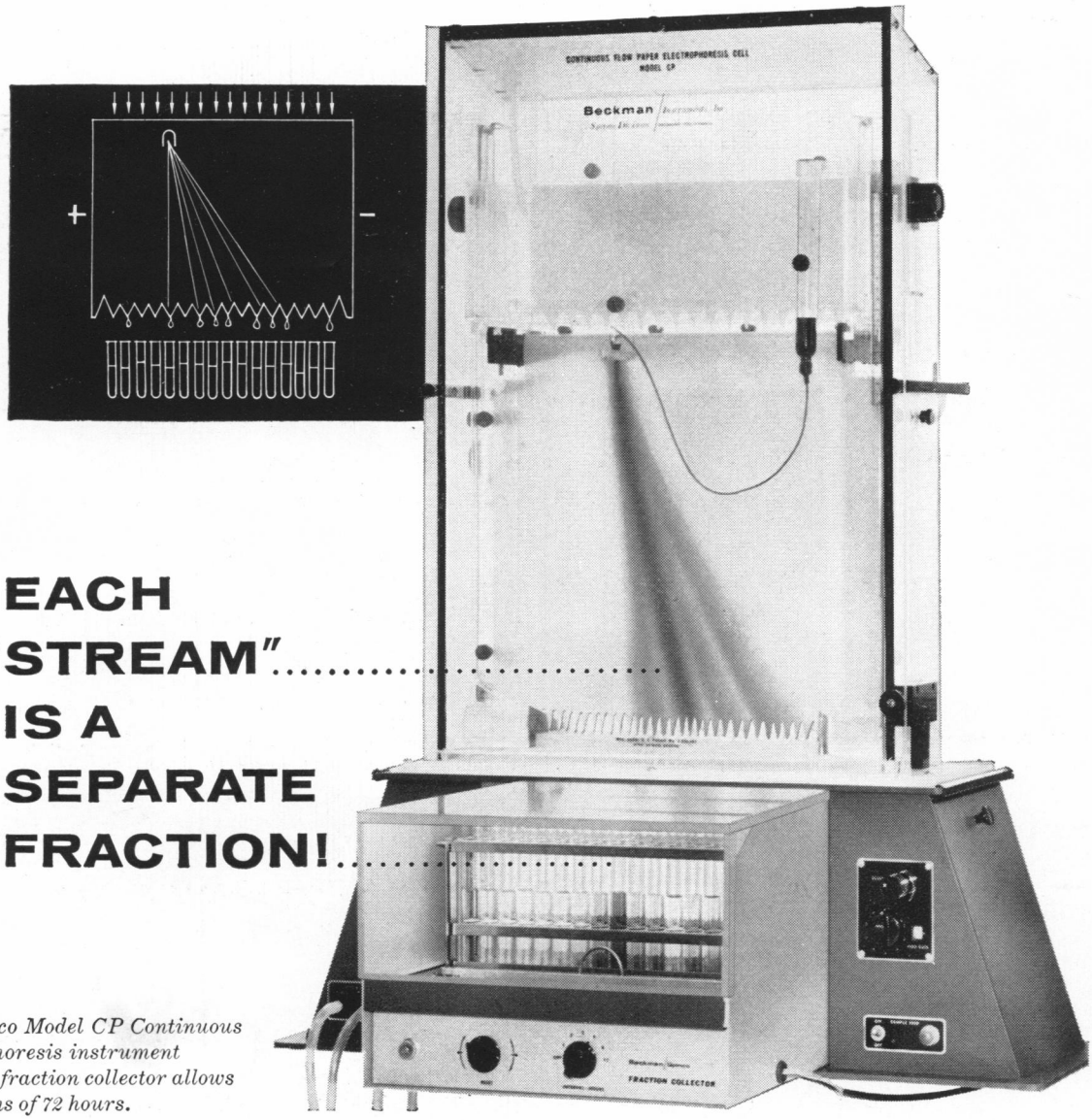
SCIENCE

13 November 1959

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE





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S-65A

13 November 1959, Volume 130, Number 3385

SCIENCE

Cover The spiny oak-slug caterpillar (*Euclea delphinii* Bdv) feeds on broad-leaf trees, such as basswood and apple. The adult moth emerges in June after a complete metamorphosis requiring one year. This insect does not cause any great degree of damage since it is not common. This is probably the result of high parasitism. Its only known parasite is *Zenillia blanda* (O.S.), a large gray fly (Tachinid). The maggot lives within the host caterpillar and eventually kills it, completing its development in the body wall and emerging as an adult fly. [Ross Jackson]

Robert Boyle...of the usefulness of mathematicks

"...I consider that without understanding as much of the abstruser part of geometry, as Archimedes or Apollonius, one may understand enough to be assisted by it in the contemplation of nature; and that one needs not know the profoundest mysteries of it to be able to discern its usefulness...I confess that after I began...to discern how useful mathematicks may be made to physicks, I have often wished that I had employed about the speculative part of geometry, and the cultivation of the specious Algebra I had been taught very young, a good part of that time and industry that I spent about surveying and fortification...and other practick parts of mathematicks."

—*Of the Usefulness of Mathematicks... 1663*

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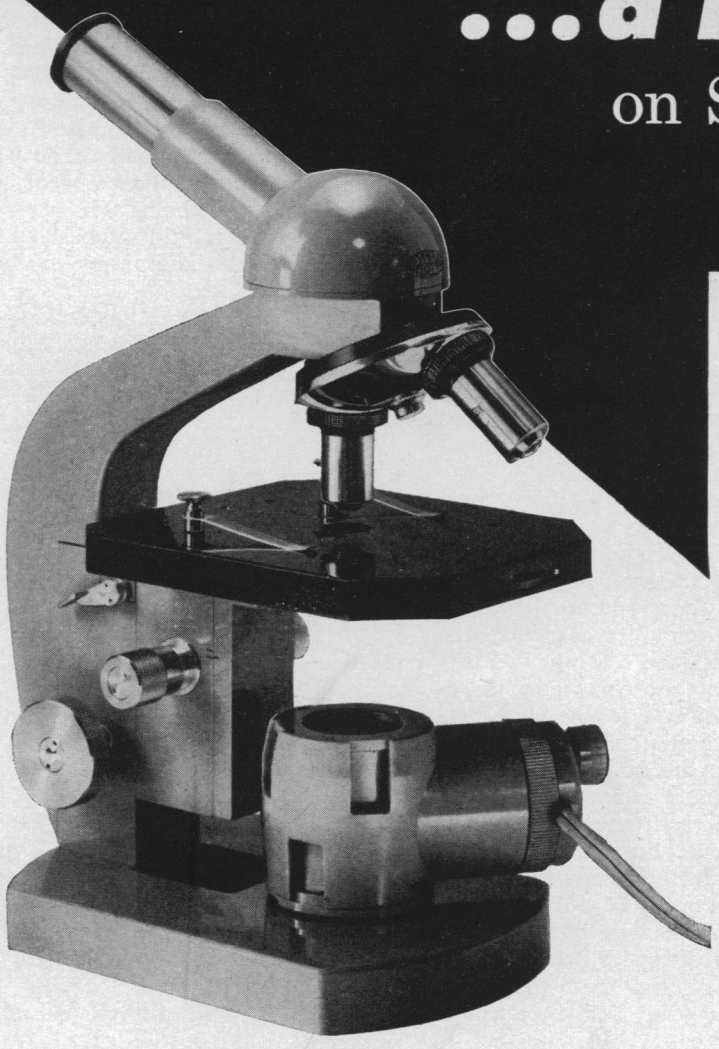

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Letters

Sex Chromatin

In a recent article (*1*), I favored the view that the sex chromatin represents heterochromatic regions of the two X chromosomes of female cells. The assumption of somatic pairing of the X chromosomes is an unsatisfactory aspect of this hypothesis. Somatic pairing of chromosomes is well known in many species of insects and has been described in the newt and frog (*2*). But evidence for such a relationship between the X chromosomes or other homologous chromosomes in somatic cells of mammals is admittedly scanty and inconclusive. For example, Ohno *et al.* (*3*) found evidence in the mouse for somatic association of the X chromosomes in epithelial cells of ovarian follicles and the mammary gland, but not in other types of cells that were examined. A possible way out of the dilemma is suggested by two important observations that have come to my attention. They demonstrate, at any rate, that the precise relationship between the sex chromatin and chromosomes is an unsolved problem that challenges the resources of cytologists.

Kosin and Ishizaki (*4*) showed that the presence of sex chromatin in somatic-cell nuclei is a female characteristic in the domestic chicken. Since the female is here the heterogametic sex, the sex chromatin cannot in this instance be a derivative of homologous sex chromosomes. Further, it is stated that the sex-chromatin complex for the female chicken is ZO (*5*). It seems, on this basis, that the sex chromatin in fowl is a derivative of the single Z chromosome, unless it bears no direct relationship to the sex-chromosome complex.

Related to the foregoing observation is the study by Ohno *et al.* (*6*) on nuclei of regenerating liver in the rat. A distinctive chromocenter was seen in interphase nuclei of females but not of males. In prophase nuclei, neither the X nor the Y chromosome of the male seemed to demonstrate positive heteropycnosis. But in prophase nuclei of females the surprising observation was made that one X chromosome was positively heteropycnotic while the other X chromosome was isopycnotic with respect to the autosomes. Ohno and his collaborators suggest that the positively heterochromatic X chromosome may be of paternal origin. It was folded back on itself in early prophase nuclei; this could explain the occasional clearly bipartite appearance of the sex chromatin. Ishizaki (*7*) states that a bipartite structure has also been detected in the sex chromatin of the chicken.

Confirmation of this work, and particularly its extension to the nuclei of man, would be of first importance in interpretation of the chromatin pattern and sex-chromosome constitution of patients with anomalies of sex development. Exact knowledge of the basis of nuclear sexual dimorphism is also needed for an explanation of the female chromatin pattern that is found in some teratomas in male hosts (*8*). We are now passing from the descriptive to the more difficult analytical phase in the study of the sex chromatin. The work of cytogeneticists and students of chromosome morphology is likely to play a decisive role in establishing the basis of sexual dimorphism in interphase nuclei.

MURRAY L. BARR
Department of Microscopic Anatomy, University of Western Ontario, London, Canada

References and Notes

1. M. L. Barr, *Science* **130**, 679 (1959).
2. J. M. N. Boss, *Texas Repts. Biol. and Med.* **13**, 213 (1955).
3. S. Ohno, W. D. Kaplan, R. Kinosita, *Exptl. Cell Research* **15**, 616 (1959); S. Ohno. E. T. Kovacs, R. Kinosita, *ibid.* **16**, 462 (1959).
4. I. L. Kosin and H. Ishizaki, *Science* **130**, 43 (1959).
5. R. A. Miller, *Anat. Record* **70**, 155 (1958); E. Witschi, *Science* **130**, 372 (1959).
6. S. Ohno, W. D. Kaplan, R. Kinosita, *Exptl. Cell Research*, in press.
7. H. Ishizaki, personal communication.
8. L. M. Myers, *J. Pathol. Bacteriol.* **78**, 43 (1959).

Position of the Catholic Church

It is very distressing to a scientist who is a Catholic to see in your columns a review such as that given by M. Edward Davis to Sulloway's *Birth Control and Catholic Doctrine* [*Science* **130**, 559 (1959)]. This distress comes *not* from the fact that Sulloway, Huxley, and Davis agree that contraception is the best method of controlling the birth rate—a position with which I heartily disagree—but from the fact that evidently neither Davis nor the editors of *Science* understand the basis upon which a review of such a work must be written.

Assuming that Davis has correctly presented the facts as assembled by Sulloway, it is also evident that Sulloway is too deficient in philosophical and theological background to have undertaken the task he set himself. This, of course, is not the responsibility of Davis or of the editors of *Science*. It is your responsibility to see that your reviews do not give a distorted picture of the situation. In what follows I shall concern myself solely with the review.

The first question that must always be considered in reviewing a book like

(Continued on page 1362)

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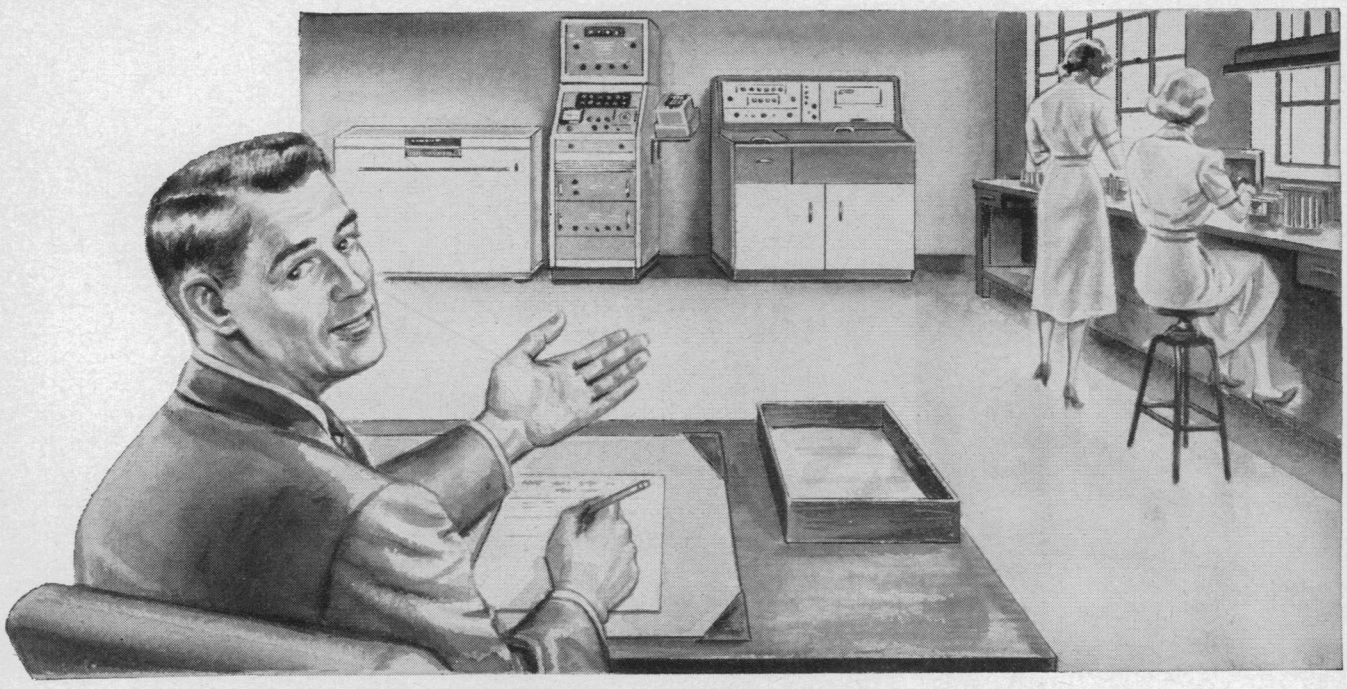

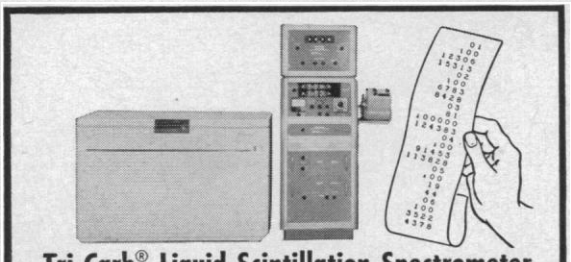

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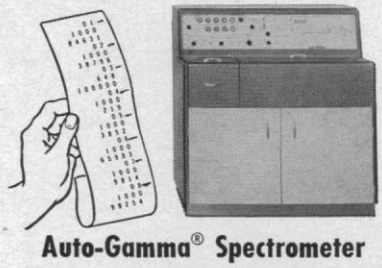

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Kodak reports on:

an easy introduction to the chemistry of photography . . . a little something for the taxpayers . . . why it's hard to keep our mind on the store

Book review

You visit a camera shop and browse among the gleaming new wonders of Kodak's Automatic Age in Photography. Possibly you buy one. Then you recall that even in an age of button-pushing, principles underlie buttons. You proceed to the Kodak literature corner and look for the title "Photo Chemistry in Black-and-White and Color Photography."

It may not be there. In that event you show this advertisement to the clerk, thereby convincing him that the book actually exists and that moreover it would mean an easy $1.25 sale for him if he would but order it for you. He, in turn, may convince you that it would be simpler to send $1.35 to Eastman Kodak Company, Sales Service Division, Rochester 4, N. Y., and get it directly by mail. See how it goes.

Acquisition accomplished, comes time to take the measure of the book's content and worth.

The early chapters could well be for the kiddies, the bright ones that start training early for eminence at the Science Fair. That simple is the author's approach to the photographic process and its history, though he writes for an adult who may lack knowledge of the difference between an element and a compound, yet keep up the payments on a split-level by his skill at something like color printing. Even here provocative tidbits sneak in. Do *you* know the difference between chemical and physical development? Between the preparation of a printing-out and a developing-out emulsion? What silver iodide does in an emulsion?

The pace quickens. By page 53, where the chapter "Chemistry of Color Development" begins, the reader is already watching dimethyl-p-phenylenediamine and α-naphthol react with silver bromide to form indophenol blue for the dye image. Soon he is following the reasons for the numerous ingredients of an actual color developer, as we add them one by one.

124 pp., including index. A triumph of exposition, theoretical and practical. You are welcome to quote that.

Microelectronics

Ever hear of the Diamond Ordnance Fuze Laboratories? It's a Department of the Army agency in Washington. To support DOFL, the average citizen shells out the federal tax on, let us say, several gallons of gasoline a year or a little tobacco. Since a fuze is a device which times an explosion to blow up his enemy, he probably wouldn't mind the expense if it were explained to him. But, *mirabile dictu* and happy day, prospects brighten that the piddling investment will pay off beyond the dreams of avarice!

DOFL has spawned "microelectronics," the shrinking of electronic assemblies to 1/100 normal size. DOFL became involved through the proximity fuze program, which requires very small and exceedingly rugged components. We are involved through certain products we make. Microelectronics may be bigger than both of us. It may make possible the placement of electronic devices inside the body, for diagnosis or for replacement or repair of human organs with electronic equivalents. It may permit a new directness in the study of the central nervous system.

The theme of microelectronics is that if you want environment-immune, highly "intelligent" circuitry that can handle problems of logic and fit into a tenth of a cubic inch of space or so, you quit at an early stage of the design thinking of transistors, diodes, capacitors, resistors, and such. Instead you think of the circuit as one or more plates half a millimeter thick and fabricated as intricately as necessary out of various conductive, semi-conductive, and dielectric materials disposed among the three dimensions of each plate.

The technique uses *Kodak High Resolution Plates* on which the geometry of the various sub-circuits is photographed from drawings at great reduction. These then become the masks under which are exposed to ultraviolet light the circuit substrate plates that have been coated with *Kodak Photo Resist*. Where the mask passes u-v, subsequent processing removes the resist and lays open the substrate for either removal of material or insertion of other materials by evaporation, printing, electro-deposition, or chemical deposition.

The next thing to do is to send to Eastman Kodak Company, Special Sensitized Products Division, Rochester 4, N. Y., for a reprint of "The DOFL Microelectronics Program."

Alkylsulfonyl from different viewpoints

A gentleman of Oak Ridge called to our attention a paper (*J. Chem. Soc., 1957*, 2420) which, in the course of examining 29 different alkylsulfonates, reports ethyl methanesulfonate as one of four which effectively inhibit a transplanted rat carcinoma. Previously Haddow and Ross (*Nature, 177*, 995) had reported that this particular compound has the striking feature of greater efficiency when administered orally in aqueous solution (20 mg/rat/day) than by daily injection of the same solution. The sequence of ideas which led Haddow and Ross to this finding is interesting.

The initial idea was that chloroethylamines are potential tumor-growth inhibitors. The second idea was to use the compound 2-chloroethyl methanesulfonate as a reagent for chloroethylating an amino group under mild conditions. The third idea was to run this reaction *in vivo* instead of *in vitro*. This actually worked. 2-Chloroethyl methanesulfonate proved an effective inhibitor in the rat both intraperitonally and orally, and it induced no significant depression of bone marrow.* The fourth idea was to write 2-chloroethyl methanesulfonate as $CH_3SO_2OCH_2$-CH_2X and vary the X from Cl to something else. With X as fluorine, cytotoxic activity persisted. The big surprise must have come with X=H, the unsubstituted ethyl methanesulfonate, the one that works better orally. This shifted the spotlight to the other end of the molecule, where dwells the methanesulfonyl group.

Our heads buzzing, we gave up trying to understand the basic biochemical issues. Our role is that of storekeeper; we must remember that. And what methanesulfonates did we have in the store? We had *n-Butyl Methanesulfonate* (Eastman 4671). (There had been requests for it. We haven't had time to track down why.) We went to work and put *Ethyl Methanesulfonate* on the stockroom shelf as Eastman 7830. Then, as a switcheroo, but with a certain seriousness of purpose, we made *Methyl Ethanesulfonate* (Eastman 7876). Perhaps someone will buy it who wants a deeper understanding of why the interchange of methyl and ethyl groups between the ends of the molecule depresses but does not destroy biological activity.

He will order from Distillation Products Industries, Rochester 3, N. Y. (Division of Eastman Kodak Company). Our Catalog is "Eastman Organic Chemicals, List No. 41." In it are to be found, described and priced, some 3700 highly purified organic chemicals for research.

*Incidentally, it also proved powerfully mutagenic in *Drosophila*, giving an unprecedented high ratio of visibles to lethals, with strongest effects on the youngest germ cells.

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Papers on maternal behavior and the socialization of kittens (Jay S. Rosenblatt and Theodore C. Schneirla, American Museum of Natural History); imprinting (Eckhard H. Hess, University of Chicago); the psychophysiological effects of infantile stimulation (Seymour Levine, Ohio State University); is early experience different? (John L. Fuller and Marcus B. Waller, Roscoe B. Jackson Memorial Laboratory). Section III: "Instinctual Behavior." Papers on some neurophysiological aspects of insect behavior (Vincent G. Dethier, University of Pennsylvania); the limbic nervous system and sexual behavior (Elliot S. Valenstein, Walter Reed Army Medical Center).

Part III; Eugene L. Bliss, University of Utah, presiding. Section III: "Instinctual Behavior" continued. Papers on the appearance of sexual behavior in platyfish reared under conditions of reduced environmental stimulation (Evelyn Shaw, American Museum of Natural History); a theory of the development of affection and love in primates (Harry F. Harlow, University of Wisconsin); interaction of hormonal and experiential factors in the development of instinctive behavior patterns (Daniel S. Lehrman, Rutgers University); the patterning of sexual behavior by genic, hormonal and experiential factors (William C. Young, University of Kansas); a behavioral approach to the study of hunger and thirst (Jean Mayer and John Falk, Harvard University); aggressive and hostile behavior in animals (John P. Scott, Roscoe B. Jackson Memorial Laboratory).

Part IV; Austin H. Riesen, University of Chicago, presiding. Section III: "Instinctual Behavior" continued. Paper on maternal behavior in the rabbit and a consideration of its endocrine basis (M. X. Zarrow and Victor H. Denenberg, Purdue University; Paul B. Sawin, Roscoe B. Jackson Memorial Laboratory; and Sherman Ross, University of Maryland). Section IV: "Free Ranging Behavior of Primates and Nonprimates." Papers will be presented on "behavioral sinks"—environmental situations which foster the development of behavioral and physiological pathology among socially structured populations of Norway rats (John B. Calhoun, National Institute of Mental Health); the phylogeny of gangs (David E. Davis, Pennsylvania State University); correlations between field and laboratory studies of social development in vertebrate animals (Nicholas E. Collias, University of California at Los Angeles); group composition and behavior correlates in primates (R. Carpenter, Pennsylvania State University); the social behavior of anthropoid primates (Stuart Altmann, Harvard University).

Dentistry

Section Nd. Symposium: "Oral Aspects of Aging"; cosponsored by Section N–Medical Sciences and the Gerontological Society; 28 Dec.; arranged by Frank J. Orland, Zoller Memorial Dental Clinic, University of Chicago, who will preside. Papers will be presented on growth and aging of the face (Samuel Pruzansky, Center for Handicapped Children, University of Illinois); the aging of tissues of the oral cavity (Earl O. Butcher and Jules Klingsberg, New York University); histochemical and histological age changes in oral subepithelial connective tissue (John R. Ring, Washington University); aging pattern in teeth of different population groups (Albert A. Dahlberg, University of Chicago); structural age changes in human teeth (John Nalbandian and Reidar F. Sognnaes, Harvard School of Dental Medicine); discussion of selected areas for investigation in oral research (David Weisberger, Harvard School of Dental Medicine and Massachusetts General Hospital).

Symposium: "American Dentistry at the Centennial Crossroad"; cosponsored by the American Dental Association,

American Association of Dental Schools, International Association for Dental Research (North American Division), American College of Dentists, and the American Academy of the History of Dentistry; 29 Dec.; arranged by Frank J. Orland, Zoller Memorial Dental Clinic, University of Chicago, who will preside. Papers will be presented on dental materials during the last hundred years: a brief résumé (George C. Paffenbarger, National Bureau of Standards); the use of epidemiology in dental research (H. Trendley Dean, National Institute of Dental Research); development of dental disease concepts and research information (Robert M. Stephan, National Institute of Dental Research); educational progress during the last century (Shailer Petersen, American Dental Association); review of journalism in the dental field (Lon W. Morrey, editor of the *Journal of the American Dental Association*); philosophical problems of dentistry in its 100th year (Byron S. Hollinshead, American Council on Education).

Pharmacy

Section Np. There will be four sessions of contributed papers; 28 and 29 Dec. Session I; arranged by John E. Christian, Purdue University, with George L. Webster, University of Illinois, presiding. Session II; arranged by John E. Christian with John Autian, University of Michigan, presiding. Session III; Hospital Pharmacy, arranged by George F. Archambault, Department of Health, Education, and Welfare, and Joseph A. Oddis, American Hospital Association, with Joseph A. Oddis presiding. Session IV; Hospital Pharmacy, arranged by George F. Archambault and Joseph A. Oddis, with George F. Archambault presiding.

Vice-presidential address by Glenn L. Jenkins, Purdue University; 29 Dec.; American Hospital Association Headquarters Building, 840 North Lake Shore Drive.

Two-session symposium: "The Scientist's Part in Protection of the Public"; 30 Dec.; arranged by John E. Christian, Purdue University. Part I: "Food, Drug, Cosmetic, and Hazardous Chemical Problems"; Joseph V. Swintosky, Smith, Kline, and French Laboratories, presiding. Papers will be presented on the labeling of hazardous chemicals—a help or a hindrance (Bernard E. Conley, American Medical Association); pharmaceutical ingredients legislation, the problems and approaches to solving them (William F. Bousquet, Purdue University); the role of the cosmetic scientist in protecting the public health (Raymond E. Reed, The Toni Company); the applications of radioisotope tracer techniques to

studying the food additive problem (John H. Rust, University of Chicago); problems in evaluating the safety of international food additives (O. Garth Fitzhugh, Department of Health, Education, and Welfare).

Part II: "Food Additive Legislation"; Glenn L. Jenkins, Purdue University, presiding. Papers on problems in evaluating the safety of unintentional food additives (A. J. Lehman, Department of Health, Education, and Welfare); scientific judgment in law and regulation (Edward J. Matson, Abbott Laboratories); the role of the scientific expert under recent food laws (Bernard L. Oser, Food and Drug Research Laboratories, Inc.). A discussion session will follow the symposium.

All the sessions of Section Np are cosponsored by the American Pharmaceutical Association Scientific Section, the American Association of Colleges of Pharmacy, American Society of Hospital Pharmacists, American College of Apothecaries, and the National Association of Boards of Pharmacy.

Forthcoming Events

December

5–10. American Acad. of Dermatology and Syphilology, Chicago, Ill. (R. R. Kierland, First National Bank Bldg., Rochester, Minn.)

6. American Acad. of Dental Medicine, mid-annual, New York, N.Y. (A. J. Cannistraci, 2152 Muliner Ave., New York 62.)

6–10. American Inst. of Chemical Engineers, annual, San Francisco, Calif. (F. J. Van Antwerpen, AICE, 25 W. 45 St., New York 36.)

7–12. Algology, UNESCO symp., New Delhi, India. (J. P. Correa, South Asia Cooperation Office, 21, Curzon Rd., New Delhi, India.)

8–10. Application of Electrical Insulation, 2nd natl. conf., Washington, D.C.) (N. S. Hibshman, AIEE, 33 W. 39 St., New York 18.)

9–15. American Acad. of Optometry, Chicago, Ill. (C. C. Koch, 1506–1508 Foshay Tower, Minneapolis 2, Minn.)

11–12. American Rheumatism Assoc., Detroit, Mich. (F. E. Demartini, Presbyterian Hospital, 622 W. 168 St., New York 32.)

11–12. Association for Research in Nervous and Mental Disease, annual, New York, N.Y. (R. J. Masselink, 700 W. 168 St., New York 32.)

11–12. Oklahoma Acad. of Science, Weatherford. (R. Kelting, Life Sciences Department, Univ. of Tulsa, Tulsa, Okla.)

11–12. Salt and Water Metabolism, symp., New York, N.Y. (A. P. Fishman, New York Heart Assoc., 10 Columbus Circle, New York 19.)

11–12. Texas Acad. of Science, Austin. (L. Kennamer, Dept. of Geography, Univ. of Texas, Austin 12.)

16–18. American Soc. of Agricultural

Engineers, Chicago, Ill. (J. L. Butt, P.O. Box 229, St. Joseph, Mich.)

25–27. Indian Mathematical Soc., 25th conf., Allahabad, India. (B. N. Prasad, Allahabad Univ., Lakshmi Niwas, George Town, Allahabad 2.)

26–30. American Assoc. for the Advancement of Science, annual, Chicago, Ill. (R. L. Taylor, AAAS, 1515 Massachusetts Ave., NW, Washington 5.)

The following 46 meetings are being held in conjunction with the AAAS annual meeting.

AAAS Committee on Science and the Promotion of Human Welfare (B. Commoner, School of Botany, Washington Univ., St. Louis 5, Mo.). 27 Dec.

AAAS Cooperative Committee on the Teaching of Science and Mathematics (Brother G. Nicholas, Univ. of Notre Dame, Notre Dame, Ind.). 27 Dec.

Academy Conference (A. M. Winchester, Stetson Univ., De Land, Fla.). 27–28 Dec.

Alpha Epsilon Delta (M. L. Moore, 7 Brookside Circle, Bronxville, N.Y.). 29 Dec.

American Assoc. of Clinical Chemists (A. Dubin, Director of Biochemistry, Cook County Hospital, Chicago 12, Ill.). 26–27 Dec.

American Geophysical Union (W. C. Krumbein, Dept. of Geology, Northwestern Univ., Evanston, Ill.). 28 Dec.

American Meteorological Soc. (K. Spengler, 3 Joy St., Boston, Mass.).

American Nature Study Soc. (E. L. Will, State Univ. Teachers College, Oneonta, N.Y.). 26–30 Dec.

American Physiological Assoc. (F. A. Hitchcock, Ohio State Univ., Columbus). 28 Dec.

American Political Science Assoc. (J. Robinson, Dept. of Political Science, Northwestern Univ., Evanston, Ill.). 28 Dec.

American Psychiatric Assoc. (E. L. Bliss, General Hospital, Salt Lake City, Utah). 28–29 Dec.

American Soc. of Criminology (D. E. J. MacNamara, New York Inst. of Criminology, Inc., New York 36). 28–29 Dec.

American Soc. of Naturalists (A. D. Hasler, Dept. of Zoology, Univ. of Wisconsin, Madison). 27–28 Dec.

American Soc. of Plant Taxonomists (L. R. Heckard, Dept. of Botany, Univ. of Illinois, Urbana). 28–30 Dec.

American Sociological Soc. (J. S. Coleman, Dept. of Sociology, Univ. of Chicago, Chicago 37, Ill.). 28–29 Dec.

American Statistical Assoc. (R. F. Winch, Dept. of Sociology, Northwestern Univ., Evanston, Ill.). 29–30 Dec.

Association of American Geographers (A. Cutshall, Univ. of Illinois, Navy Pier, Chicago 11). 29 Dec.

Association for Computing Machinery (W. F. Cahill, Goddard Space Flight Center, Silver Spring, Md.). 29 Dec.

Astronomical League (E. Halbach, 2971 S. 52 St., Milwaukee 19, Wisc.). 26 Dec.

Beta Beta Beta (Mrs. F. G. Brooks, P.O. Box 515, Ansonia Station, New York 23). 27–28 Dec.

Chicago Acad. of Sciences (R. A. Edgren, Chicago Academy of Sciences, 2001 North Clark St., Chicago 14, Ill.) 29-30 Dec.

Conference on Scientific Communications (G. L. Seielstad, Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.). 28–29 Dec.

Conference on Scientific Manpower (T. J. Mills, National Science Foundation, Washington 25). 28 Dec.

Ecological Soc. of America (W. C. Ashby, Dept. of Botany, Univ. of Chicago, Chicago 37, Ill.). 28–30 Dec.

Honor Soc. of Phi Kappa Phi (L. R. Guild, 634 S. Western Ave., Los Angeles 5, Calif.). 30–31 Dec.

Illinois Geographical Soc. (Miss M. Grant, Morton Junior College, Cicero, Ill.). 28 Dec.

Institute of Management Sciences (M. M. Flood, College of Engineering, Univ. of Michigan, Ann Arbor). 29 Dec.

Metric Assoc. (J. T. Johnson, Ravenswood YMCA, 1725 Wilson Ave., Chicago 40, Ill.).

Mycological Soc. of America (D. P. Rogers, Dept. of Botany, Univ. of Illinois, Urbana).

National Assoc. of Biology Teachers (H. E. Weaver, 202 Men's Old Gym, Univ. of Illinois, Urbana). 26–30 Dec.

National Acad. of Economics and Po-

litical Science (J. Rothrock, Pan American Union, Washington 6). 29 Dec.

National Assoc. for Research in Science Teaching (J. C. Mayfield, Univ. of Chicago, Chicago 37, Ill.). 26–30 Dec.

National Assoc. of Science Writers (P. Fraley, Evening Bulletin, Philadelphia, Pa.). 27 Dec.

National Geographic Soc. (W. R. Gray, NGS, 16 and M Sts., NW, Washington 6). 30 Dec.

National Science Teachers Assoc. (R. H. Carleton, NSTA, 1201 16 St., NW, Washington, D.C.). 26–30 Dec.

National Soc. for Medical Research (R. A. Rohweder, NSMR, 920 S. Michigan Blvd., Chicago 5, Ill.). 29 Dec.

National Speleological Soc. (T. C. Barr, Jr., Tennessee Polytechnic Inst., Cookeville, Tenn.). 28 Dec.

Philosophy of Science Assoc. (W. A. R. Ley, Roosevelt College, Chicago, Ill.). 28 Dec.

Scientific Research Soc. of America (D. B. Prentice, 56 Hillhouse Ave., New Haven 11, Conn.). 29 Dec.

Sigma Delta Epsilon (Miss E. S. Anderson, Stratford Hotel, 25 E St., NW, Washington, D.C.). 26–30 Dec.

Society for General Systems Research (R. L. Meier, Mental Health Research Institute, Univ. of Michigan, Ann Arbor).

Society for the History of Technology (M. Kronzberg, Dept. of History, Case Inst. of Technology, Cleveland, Ohio).

Society of the Sigma Xi (T. T. Holme, 56 Hillhouse Ave., New Haven 11, Conn.). 29 Dec.

Society of Systematic Zoology (R. E. Blackwelder, Southern Illinois Univ., Carbondale). 26–30 Dec.

Tau Beta Pi Assoc. (R. H. Nagel, Univ. of Tennessee, Knoxville). 27 Dec.

United Chapters of Phi Beta Kappa (C. Billman, 1811 Q St., NW, Washington, D.C.). 29 Dec.

27–30. American Anthropological Assoc., Mexico City. (W. S. Godfrey, Jr., Logan Museum, Beloit College, Beloit, Wisc.)

27–30. American Astronomical Soc., Cleveland, Ohio. (J. A. Hynek, Smithsonian Astrophysical Observatory, 60 Garden St., Cambridge 38, Mass.)

27–30. American Folklore Soc., Mexico City. (MacE. Leach, 110 Bennett Hall, Univ. of Pennsylvania, Philadelphia 4.)

27–30. American Statistical Assoc., Washington, D.C. (D. C. Riley, 1757 K St., NW, Washington 6.)

27–30. Institute of Mathematical Statistics (weather control), Washington, D.C. (J. Neyman, Statistical Lab., Univ. of California, Berkeley 4.)

28–29. American Chemical Soc. (Div. of Industrial and Engineering Chemistry), symp., Baltimore, Md. (M. A. H. Emery, ACS, 18 and K Sts., NW, Washington D.C.)

28–29. Industrial Relations Research Assoc., Washington, D.C. (E. Young, Sterling Hall, Univ. of Wisconsin, Madison.

28–29 Mechanism of Interfacial Reaction, American Chemical Soc., annual symp, Baltimore, Md. (H. E. Hoelscher, Chemical Engineering Dept., Johns Hopkins Univ., Baltimore, Md.)

28–29. Lepidopterists' Soc., 10th annual,

Ann Arbor, Mich. (E. G. Voss or W. H. Wagner, Dept. of Botany, Univ. of Michigan, Ann Arbor.)

28–29. Northwest Scientific Assoc., Spokane, Wash. (W. B. Merriam, Dept. of Geography, State College of Washington, Pullman.)

28–30. American Economic Assoc., Washington, D.C. (J. W. Bell, Northwestern Univ., 629 Noyes St., Evanston, Ill.)

28–30. American Philosophical Assoc. (eastern div.), New York, N.Y. (L. Garvin, Dept. of Philosophy, Univ of Maryland, College Park.)

28–30. American Physical Soc., Pasadena, Calif. (K. Darrow, APS, Columbia Univ., 116 St. and Broadway, New York, N.Y.)

28–30. Econometric Soc., Washington, D.C. (R. Ruggles, Dept. of Economics, Yale Univ., New Haven, Conn.)

28–30. Western Soc. of Naturalists, Los Angeles, Calif. (Y. U. Amrein, Dept. of Zoology, Pomona College, Claremont, Calif.)

28–31. Phi Delta Kappa, Columbia, Mo. (A. G. Clark, 316 Dalzell Ave., Ben Avon, Pittsburgh 2, Pa.)

28–16. Bahamas Surgical Conf., Nassau. (B. L. Frank, P.O. Box 4037, Fort Lauderdale, Fla.)

January

1–5. Electrochemical Soc., Chicago, Ill. (Electrochemical Soc., Inc., 216 W. 102 St., New York 25.)

1–5. Institute of Geographers, annual conf., Southampton, England. (A. E. Smailes, Queen Mary College, Univ. of London, Mile End Rd., London, E.1.)

3–9. Indian Science Cong. Assoc., 4th, Bombay. (B. W. Prasad, ISCA, Lakshmi Niwas, Georgetown, Allahabad 2, India.)

5–7. Recent Mechanical Engineering Developments in Automatic Control, symp., London, England. (Institution of Mechanical Engineers, 1 Birdcage Walk, London, S.W.1.)

6–8. Northeastern Weed Control Conf., 14th annual, New York, N.Y. (M. G. Wiltse, Chairman, Public Relations Committee, Dow Chemical Co., 916 Shoreham Bldg., 15 and H Sts., NW, Washington 5.)

7–10. Radioactive Isotopes, 4th intern. symp., Bad Gastein, Austria. (R. Hofer, Isotopen-Laboratorium, II. Medizenische Universitäts Klinik, 13, Garnisongasse, Vienna 9, Austria.)

8–11. Sanitary Engineering Conf., ASCE, Cincinnati, Ohio. (E. S. Kirkpatrick, ASCE, 33 W. 39 St., New York 18.)

11–13. American Acad. of Allergy, Hollywood-by-the-Sea, Fla. (J. O. Kelley, 756 N. Milwaukee St., Milwaukee 2, Wisc.)

11–13. Arctic Geology, 1st intern. symp., Calgary, Alberta, Canada. (D. W. R. Wilson, Arctic Symposium Committee, P.O. Box 100, Calgary, Alberta, Canada.)

11–13. Reliability and Quality Control, natl. symp., Washington, D.C. (N. S. Hibshman, AIEE, 33 W. 39 St., New York 18.)

11–15. Society of Automotive Engineers, annual, Detroit, Mich. (R. W. Crory, Meetings Operation Dept., SAE, 485 Lexington Ave., New York 17.)

11–25. Effects of Atomic Radiation, New York, N.Y. (R. Appleyard, Scientific

Committee on the Effects of Radiation, United Nations, New York 17.)

12–15. Society of Plastics Engineers, 16th annual conf., Chicago, Ill. (T. A. Bissell, SPE, 65 Prospect St., Stamford, Conn.)

14–18. American Inst. of Mining, Metallurgical, and Petroleum Engineers, annual, New York, N.Y. (E. O. Kirkendall, AIMMPE, 29 W. 39 St., New York 18.)

17–30. Bahamas Medical Serendipity Conf., 2nd, Nassau. (B. L. Frank, P.O. Box 4037, Fort Lauderdale, Fla.)

18–21. American Astronautical Soc., 6th annual, New York, N.Y. (A. P. Mayernik, AAS, 6708 53 Rd., Maspeth 78, N.Y.)

19–21. American Meteorological Soc., 40th annual, Boston, Mass. (K. C. Spengler, 3 Joy St., Boston.)

19–21. Congenital Malformations, CIBA symp. (by invitation only), London, England. (G. E. W. Wolstenholme, 41 Portland Pl., London, W.1.)

21–23. American College of Surgeons, Louisville, Ky. (H. P. Saunders, 40 E. Erie St., Chicago 11, Ill.)

23–28. American Acad. of Orthopedic Surgeons, Chicago, Ill. (J. K. Hart, 116 S. Michigan, Chicago 3.)

24–29. American Rocket Soc., Princeton, N.J. (J. J. Harford, ARS, 500 Fifth Ave., New York 36.)

25–28. Institute of the Aeronautical Sciences, 28th annual, New York, N.Y. (IAS, 2 E. 64 St., New York 21.)

25–28. Plant Maintenance and Engineering Show, Philadelphia, Pa. (R. S. Wolcott, Clapp & Poliak, 341 Madison Ave., New York 17.)

25–29. Stress Measurement Methods, symp., Tempe, Ariz. (P. K. Stein, Strain Gage Readings, 5602 East Monte Rosa, Phoenix, Ariz.)

27–28. College-Industry Conf., Amer. Soc. for Engineering Education, St. Louis, Mo. (W. L. Collins, ASED, Univ. of Illinois Urbana.)

27–28. Group Therapist, 4th annual, AGPA, New York, N.Y. (American Group Psychotherapy Assoc., Inc., 1790 Broadway, New York 19.)

27–29. American Mathematical Soc., 66th annual, Chicago, Ill. (J. W. Green, Univ. of California, Los Angeles 34.)

27–30. American Physical Soc., annual, New York, N.Y. (K. Darrow, APS, Columbia Univ., 116 St. and Broadway, New York.)

28–30. Mathematical Assn. of America, 43rd annual, Chicago, Ill. (H. M. Gehman, Univ. of Buffalo, Buffalo 14, N.Y.)

28–30. Western Soc. for Clinical Research, 13th annual, Carmel-by-the-Sea, Calif. (W. N. Valentine, Western Soc. for Clinical Research, Univ. of California Medical Center, Dept. of Medicine, Los Angeles 24.)

29–30. American Group Psychotherapy Assoc., Inc., 17th annual conf., New York, N.Y. (American Group Psychotherapy Assoc., Inc., 1790 Broadway, New York 19.)

31–5. American Inst. of Electrical Engineers, New York, N.Y. (N. S. Hibshman, AIEE, 33 W. 39 St., New York 18.)

31–7. Pan American Cong. of Ophthalmology, 6th, Caracas, Venezuela. (J. W. McKinney, 921 Exchange Bldg., Memphis, Tenn.)

New Products

The information reported here is obtained from manufacturers and from other sources considered to be reliable. Neither Science *nor the writer assumes responsibility for the accuracy of the information. A coupon for use in making inquiries concerning the items listed is included in the post card insert.*

■ NULL DETECTOR designed for use with bridges is a tuned detector covering the frequency range 20 cy to 200 kcy/sec. Input impedance is 1 megohm shunted by 100 $\mu\mu$f. Indication is provided by a 2-in. cathode-ray tube with deflection of 0.25 in. for 10-μv input. Discrimination against the second harmonic is 40 db. (Boonton Electronics Corp., Dept. 189)

■ CENTRIFUGE for testing has two outboard rotating tables mounted on the boom. One table, electrically driven, may be rotated at 0 to 1800 rev/min to provide sinusoidally varying fields. The other table, electropneumatically operated, permits $\pm$90 deg rotation in milliseconds to produce high-acceleration ramp functions. Speed of the main arm is controlled through an electrohydraulic servo system. (Genisco, Dept. 191)

■ SHAFT-ANGLE ENCODER provides full-scale encoding of 1000 revolutions with 1000 code positions per revolution. A first 1000-position encoder is geared 100-to-1 to a 100-position encoder, and the latter is geared to a 10-position encoder. The device will operate at temperatures from 32° to 150°F and in vibration environments of 8 *g* at 2000 cy/sec. (Datex Corp., Dept. 192)

■ METERING PUMP is adjustable from 0 to 6.44 cm^3 per stroke. Pumping pressure can be as much as 354 lb/in.^{2} and is determined by the operating air pressure and the bore of the air cylinder. The pump is actuated by a solenoid. (Airmatic Valve, Dept. 197)

■ SHOCK INDICATORS indicate shock experienced by delicate equipment in shipment. The units indicate visibly that a predetermined permissible level has been exceeded. One- or two-plane or spherical sensitivity can be provided in ranges from 5 to 75 *g* with $\pm$5 percent accuracy. The devices are reusable and resettable. (Inertia Switch, Dpt. 198)

■ TEMPERATURE RECORDER measures and records up to 75 iron-constantan thermocouple inputs. The system consists of an input scanner, self-balancing potentiometer, shaft encoders, encoder selector, control chassis, programmer, digital clock, and electric typewriter. Temperature ranges are –30° to 120°; 250° to 600°, and 0° to 1200°F. Scan-

ning rate is 3 sec per data point. Accuracy is said to be $\pm 1°F$ in the lower ranges and $\pm 5°F$ in the highest range. Read-out format is two decimal digits of identification and four decimal digits of temperature. (Datex Corp., Dept. 200)

■ DROP COUNTER, for fraction collection, manufactured by LKB-Produkter of Sweden, uses a photoelectric cell to detect falling drops. Fraction sizes from 0.1 to 10 ml and of 4, 8, 16, 32, 64, and 128 drops per fraction can be selected. (Ivan Sorvall, Dept. 205)

■ MAGNETORESISTOR is a semiconductor in which electrical resistance is a function of magnetic field, featuring a 10-to-1 change in resistance with an applied field of 10 kgauss. The device utilizes indium antimonide. Typical specifications are: Resistance, 1 ohm ± 20 percent; power rating, 0.25 watt; temperature range, 0° to 100°C; dimensions, ⅝ by ½ by 0.03 in. (Ohio Semiconductors, Inc., Dept. 207)

■ MULTIPLIER PHOTOTUBES for measurement of very low levels of radioactivity are fabricated of selected materials that contain very few radioactive contaminants. The tubes have quartz face plates. A tube 3 in. in diameter has been announced. (Allen B. DuMont Laboratories, Dept. 199)

■ ANALOG MULTIPLIER is said to provide four-quadrant multiplication with dynamic accuracy ± 0.05 percent of full scale at 500 cy/sec. In the device, one variable is used to control frequency deviation about the 1.5 Mcy/sec. reference frequency, while the other variable controls the amplitude of the carrier. Multipliers may be used as dividers by manipulation of a single relay. An output selection circuit scales output as $xx/100$, $xy/10$ or xy. Noise level is less than 30 mv, drift less than 50 mv in 8 hr. Input impedance is greater than 1 Mohm; output impedance is approximately 0.05 ohm. (Computer Systems, Dept. 206)

■ RECORDER for strain-versus-load data is a 24-channel instrument with one, two or four active bridge arms. Individual graphs and three zero positions are provided for each channel. Either 4 or 24 gage-factor controls and range selectors are furnished. Adjustment of zero and gage factor is automatic. (Gilmore Industries, Dept. 201)

■ VOLTMETER of potentiometer type measures from 0 to 10 volts d-c on either polarity with accuracy said to be ± 0.025 percent plus 3 μv in portable operation. Read-out is provided by six decade switch dials with resolution of ± 10 μv and by a panel galvanometer for fractional microvolt resolution. Stability of reference supply is said to be ± 0.005 percent for line variation from 107 to 127 volts. (Siegler Corp., Dept. 202)

■ ULTRASONIC WELDER for small and delicate assemblies accomplishes welding without melting and without passage of electric current through parts to be joined. Power input is 100 watts. (Aeroprojects, Inc., Dept. 208)

■ IMAGE AMPLIFIER uses television techniques to show 11-by-11-in. fluoroscopic images on television-type monitors. With this equipment, a radiation rate of 2 mr is said to be adequate for diagnostic viewing of a thorax. Accessory equipment to be available in the future will permit holding of an image without continued irradiation. (Marconi Instruments, Ltd., Dept. 209)

■ SPECTRUM ANALYZER for the range 50 cy to 100 kcy/sec applies any 2.5 kcy/sec input band simultaneously to 100 32-cy/sec band-pass filters and scans the filter outputs in sequence at a rate of 3450 per minute. Resolution

is 75 cy/sec with dynamic resolving range 35 to 40 db. Variations in amplitude response are within ±3 db. Another model is available with resolution 250 cy/sec. (Raytheon Co., Dept. 213)

■ THERMISTOR SLIDE RULE is entered with thermistor shape desired and resistance at 25°C and reads resistance at all temperature points of the thermistor curve. Dimensions, dissipation and time constants, and maximum temperature limits are also given for several hundred thermistors. (Fenwal Electronics, Dept. 214)

■ RESISTANCE BRIDGE uses an electronic null indicator to permit rapid inspection of resistors on an accept-reject basis with accuracy said to be ± 0.2 percent. The range 10 ohm to 11,111,100 ohm is covered in 10-ohm steps with tolerance adjustable between ±1 and ±20 percent. (Shallcross Manufacturing Co., Dept. 217)

■ KERR-CELL SHUTTER consists of a Kerr cell, spark gap, pulse transformer, high-voltage power supply, and variable-delay trigger generator. Exposure time is 30 mμsec. Cell aperture is 40 by 40 mm, 20 mm thick, and transmission ratio is 10^6. Trigger may be manual, contact closure, or step voltage, with delay 1 to 125 μsec. (Oltronix Inc., Dept. 211)

■ VACUUM PUMP depends on the reaction between gases and titanium vapor to produce vacuums in the range 0.05 to 1×10^{-9} mm-Hg. The device consists of a stainless-steel cartridge 7 5/16 in. long and approximately ½ in. diameter. A source of 60-amp, 3-volt power is used to evaporate the titanium. Pumping speed is approximately 5 liter/sec; filament life is approximately 500, 1-min evaporations at 1 μ-Hg or lower. Filaments are replaceable. (National Research Corp. Dept. 215)

■ COOLING DEVICE for infrared detectors operates by expanding 300 lb/in.² helium in a ¼-in. diameter cylinder 2-in. long. The temperature of the infrared cell is reduced to 60°K. Weight of the cooler is 8 oz. (Arthur D. Little, Inc., Dept. 212)

■ NOISE SOURCE consists of a "white-noise" generator that can be set for constant energy per cycle or per octave, feeding through a driver amplifier into eight attenuators, each in turn connected to an octave-band filter. Spectrum coverage is 20 to 9600 cy/sec with provision for a ninth band 9600 to 19,200 cy/sec. Each band can be adjusted to simulate an environmental noise spectrum. (Allison Laboratories, Inc., Dept. 216)

■ LEVEL-SENSING POTENTIOMETER is an air-bubble type in which the fluid is an electrolyte. Electrodes are arranged in the curved glass tube so that resistances between two end electrodes and a center electrode are equal when the unit is horizontal. When the instrument is used as half of a 1000-ohm bridge with 12 volts applied, tilting of 0.25 deg produces an output of 4 volts. Saturation is reached at approximately ¾ deg. (Hamlin, Inc., Dept. 220)

■ POWER AMPLIFIER for particle-accelerator drive applications is tunable from 195 to 205 Mcy/sec, producing 1-to-20 kw peak pulse output with input pulse power of 50 watts. Pulse repetition rate is 5 to 60 per second. Pulse length is variable from 150 to 400 μsec, with rise time 5 μsec from 10 to 90 percent and droop less than 5 percent. Remote console operation can be arranged. (Levinthal Electronic Products, Dept. 222)

■ TRANSFER-FUNCTION BRIDGE measures input and output impedance and admittance of two-, three-, and four-terminal devices and networks over the

frequency range 25 to 1500 Mcy/sec. Standard mounts are available for measurements on transistors and for common-cathode measurements on seven-pin miniature tubes. The bride is passive; stability of calibration is dependent only on physical dimensions. Measurement ranges are: voltage and current ratios, 0 to 20; transimpedance, 0 to 1500 ohm; transadmittance, 0 to 600 mho; impedance, 0 to 1000 ohm; admittance, 0 to 400 mho. (General Radio Co., Dept. 221)

■ PHYSIOLOGICAL DATA TELEMETERING SYSTEM is a 20-lb. electronic package that measures blood pressure, heart rate, heart sounds, respiration rate and depth, skin temperature, and galvanic skin resistance. Intended for space research, the equipment is designed to operate in extreme environmental temperatures and under accelerations of several grav. (Gulton Industries, Inc., Dept. 219)

■ SUBCARRIER OSCILLATOR CALIBRATOR for FM telemetering calibration in field or laboratory is said to maintain accuracy of ±¼ percent bandwidth under all conditions of use. The panel meter reads directly in percentage bandwidth; meters for remote indication are available. (Wayne D. Patterson, Inc., Dept. 218)

JOSHUA STERN

National Bureau of Standards, Washington, D.C.

Letters

(Continued from page 1302)

Sulloway's, which purports to set out Catholic doctrine on some subject, is to determine whether the Catholic Church has actually taken a doctrinal stand in the matter. Unless she has, there *is* no "position of the Catholic Church," and writers may, and almost always do, argue pro and con.

The Church is considered to have taken a doctrinal stand in a matter when she has (i) made an infallible pronouncement by the head of the Church; (ii) defined by an Ecumenical Council; (iii) authoritatively proposed some creed, formula of belief, or matter of moral behavior.

Consider two examples, the first being the question of the geocentric and heliocentric theories of planetary motion. When the latter was first proposed in university circles by a Catholic, Copernicus, some Catholic writers were for it, but the great majority were against it. The Church, however, did not then, and never has since, taken a *doctrinal* stand in the matter. The fact that "Catholic authors" adopted this or that position does not have anything to do with the question.

For many centuries the majority of "Catholic authors" took the position that at the end of her earthly career the mother of Christ was taken up body and soul into heaven. There were, however, some "Catholic authors" who thought her body was not assumed. After 1 November 1950 the matter was closed by a formal doctrinal statement by the head of the church.

In the case of birth control the Church never has taken a doctrinal stand that "separation of intercourse and parenthood" is wrong. If she had, she could never have allowed marriage between those who are sterile, nor between those who, because of advanced age, have passed the time when conception can naturally take place. However, the legitimacy of the union and the rights of the partners to use their marital privileges have been recognized in these cases for centuries. Unfortunately, since Davis was unaware of these points, he was unable to point out that a major part of Sulloway's thesis is irrelevant.

The second question that must be considered concerns the nature of the Catholic Church.

It is certainly understandable that Sulloway, believing the Church both inconsistent and in error, would hope it would change its mind on (what he thinks is) its doctrinal stand. Your reviewer is apparently unaware that an *essential* claim of the Catholic Church is that when it *does* take a definite doc-

trinal stand it cannot be in error. This is because the Church believes it was founded by God and guaranteed by him against error in "faith and morals." Over a period of 20 centuries the Church has never made an essential change in any of its doctrines.

Two other points should be mentioned in connection with the review.

1) Davis believes that the method of birth control does not determine the morality of marital intercourse as long as the married couple "intends in good faith to have children and does have them." The Catholic Church, on the other hand, believes that the end does not justify the means, and that the use of bad means for a good end makes the act morally bad. While the end, limitation of the number of children, may be good in some cases, the means, artificial birth control, are always bad.

2) Davis does not make a proper distinction between the Church's philosophical and theological position and the *tactics* that may be employed by Catholics in certain instances. The *laws* against contraceptives were placed on the statute books of Massachusetts and Connecticut by Protestants in the latter part of the 19th century. It is only natural that, in opposing Margaret Sanger and her coworkers of 1914, Catholics should make use of existing laws. The "first line of defense" against a fire is an existing firehose.

Finally, I hope that in the future, when books of this type are reviewed, the editors of *Science* will insist on the same objectivity in presentation of the position of the Catholic Church that they would on any strictly scientific matter.

J. KENNETH O'LOANE
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Rochester, New York

Moon Illusion and Age

Leibowitz and Hartman in their report "Magnitude of the moon illusion as a function of the age of the observer" [*Science* **130**, 569 (1959)] interpret the moon illusion "as resulting from a normal developmental process, namely the dependence of the magnitude of the size constancy correction on experience." This conclusion is not in conflict with the result of their outdoor experiment, where presumably there were objects of common experience in the horizontal plane which could provide the subjects with size standards and with landmarks for parallax distance determination. However, it is difficult on the basis of this "experience" theory to see how the same results could be obtained in a darkened theater. If the theater is darkened to the extent that

no common objects remain in view, then accommodation and convergence will provide the only cues to the distance of the disks. (I assume this was the reason for conducting the experiment in the dark.) In the darkened theater, then, there remain but two variables: the position of the head relative to the body, and the angular aspect of the otolithic organs. While it seems reasonable that these might be related to perceived size, it is not clear why the postural experience of children and adults should lead to the results obtained.

Furthermore, I would like to point out one assumption underlying the mathematical sign of the correction. The authors state that, for near objects, "for a given retinal image size, perceived size is proportional to distance. However, as the observation distance is increased, this correction is no longer complete, and especially so the younger the subject." This implies that the correction is a magnification which increases with increasing distance. I note that, just as logically, the correction might be a diminution which increases in absolute value with decreasing distance. This distinction bears on the following point. That the illusion is stronger for the children than the adults may be explained in two ways. Either the children misjudge the distance of the disk when it is overhead (believing it to be closer than the adults believe it to be) and "correct" just as an adult would for an object at that distance, or the children judge the distance of the overhead moon as an adult would but apply a correction different from that an adult would apply. (I take the first quotation in this letter to indicate that the authors favor the latter explanation.) Now here the sign of the correction assumes importance. If the correction is a magnification, in the above sense, then the children are not correcting enough, and the correction will increase with age. But, on the other hand, if the correction is a diminution, then the children are overcorrecting, and the correction will decrease with age.

HOWARD C. HOWLAND
Department of Zoology, University of Pennsylvania, Philadelphia

We agree with Howland with respect to the possible importance of postural and vestibular cues as factors influencing perceived size. It seems reasonable to assume, on the basis of developmental studies, that children may be more dependent on stimulation from proprioceptors than adults. Whether this is also true for perceived size is currently being investigated in this laboratory.

While it is logically correct to consider that the size constancy "correc-

tion" might be a diminution which increases in absolute value with decreasing distance, such an assumption would not be preferred, in view of the experimental data relating size matches to the age of the observer. Children and adults produce the same matches—that is, make a correction for distance of the same magnitude—for close observation distances. It is only by increasing distance that differences are obtained, as manifested by the more rapid falling off of the tendency toward constancy for the younger as compared to the older subjects. We have interpreted these data to imply the following relationship: the younger the subject and the greater the distance of observation, the smaller the magnitude of the correction. We suggested also that experience plays a role in this correction, although we are not certain whether it is mediated by visual or proprioceptive cues. The data obtained in the dark room, which presented some visual cues due to scattered light from the projector beams, do not permit us to make a decision at this time.

The suggestion that one investigate the role of perceived distance, with perceived size considered as a secondary effect, is both logical and tempting. Experimentally, however, it has proved to be relatively easy to obtain reliable measures of perceived size but extremely difficult to measure perceived distance, especially with children. For this reason, we prefer to avoid speculating as to whether perceived size or perceived distance is the more basic variable, and to emphasize the dependent variable of matched size, which can be assessed experimentally. We know for certain that as physical distance is increased, size matches become less veridical, but we are not able, due to methodological limitations, to determine whether these data result from a failure of perceived size or of perceived distance.

H. LEIBOWITZ
T. HARTMAN
University of Wisconsin, Madison

Correlation

The recent Stetten and Hearon report, "Intellectual level measured by Army Classification Battery and serum uric acid concentration" [*Science* **129**, 1737 (1959)], gives a coefficient of correlation of +.0759, which the authors in effect say is statistically significant. From this result the authors conclude that "a low level of positive correlation . . . does indeed exist between the score attained in the ACB test and the level of uric acid in blood serum in the population studied."

Leaving aside the unusual device of reporting an estimate like this to four decimal places, we have here a coefficient of correlation of about .08. Even though the result is statistically significant, it is very doubtful that the conclusion follows. This is evidently a case of confusing statistical significance with practical or scientific significance. If the coefficient is squared, the result yields an estimate of the percentage of the common factor variance shared by the two variables. Squaring it, we get .0064, or about 0.6 percent. Thus, to be generous, it can be said that the variables of this study share about 1 percent of their variance in common! (Incidentally, the assumption of normality is not necessary for computing r, as the authors imply [see M. D. Nefzger and J. Drasgow, *Am. Psychologist* **12**, 623 (1957)]).

FRED N. KERLINGER
School of Education, New York University, New York

In our earlier publication we found and reported a small but statistically significant correlation between score achieved in the Army Classification Battery and serum uric acid concentration in the population studied. Kerlinger apparently agrees with these findings but questions our conclusion, which is merely a restatement of these findings, that the correlation coefficient obtained is positive, small, and significantly different from zero. There is no confusion in our report between "statistical" and "practical" significance, since we have used the term *significant* only in its statistical sense. The correlation was originally examined for what appeared to us to be adequate reasons, stated in our earlier communication, and the value of r, though small, was considered worthy of publication, since it answered a question raised by Haldane [J. B. S. Haldane, *Nature* **176**, 169 (1955)].

The interpretation of the answer is left to the reader. The improvement of the estimation of one variable from the knowledge of its correlation with the other is small by any test, including the statistic r^2 employed by Kerlinger, and it was never our intention to suggest replacement of intelligence testing by serum urate analyses. Although not helpful in the prediction of one variable from knowledge of the other, the correlation might provoke inquiry into a possible biological basis. Incidentally, it was neither stated nor implied that the assumption of normality is necessary for computing r. The assumption is necessary, however, as we have clearly stated, for the test of significance which we employed.

DEWITT STETTEN, JR.
JOHN Z. HEARON
National Institutes of Health, Bethesda, Maryland