SCIENCE 15 September 1967
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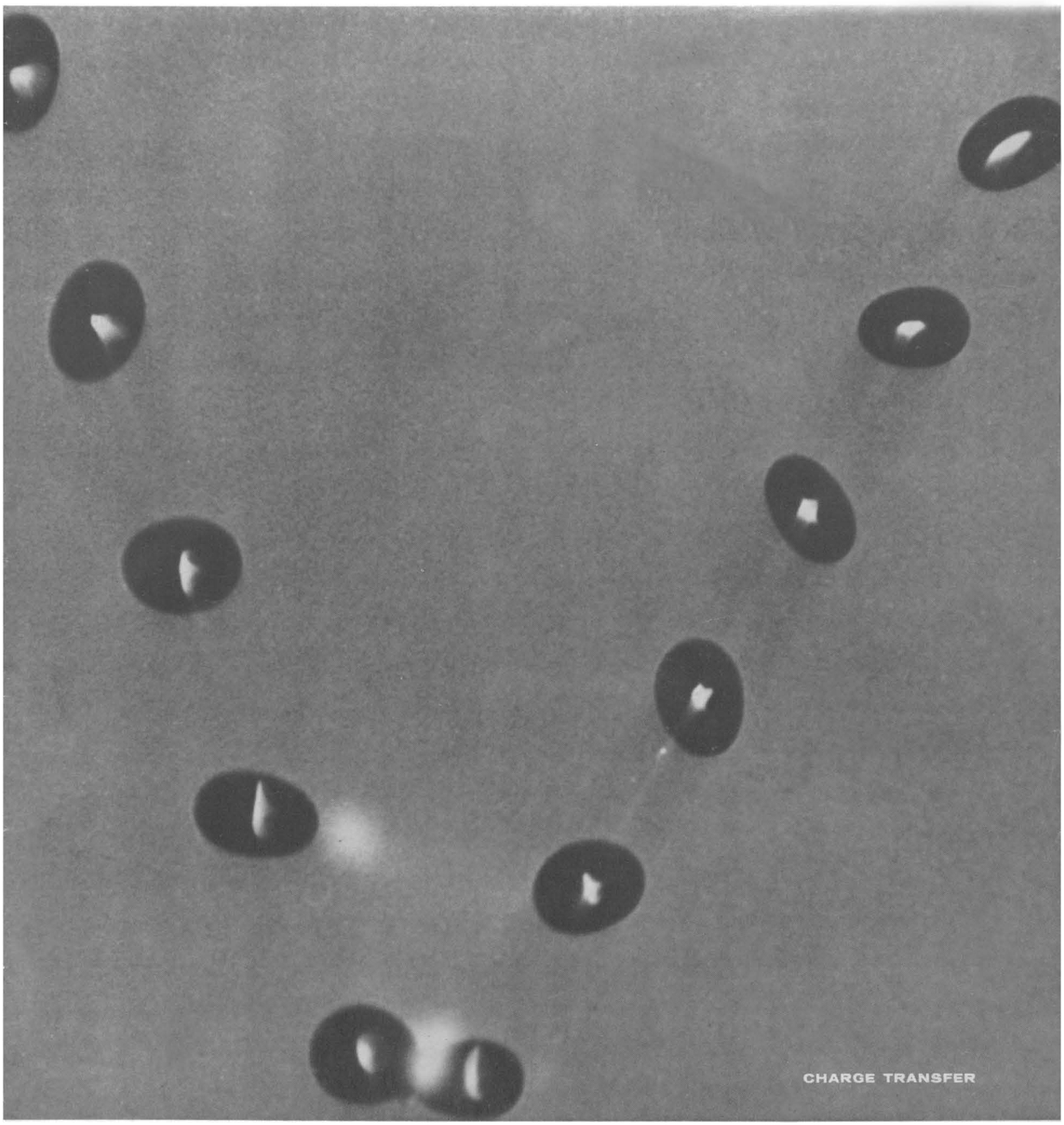
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



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The Scanner and Multiplexer. The Photoelectric Scanner was introduced just last year. It scans the cell directly through the Model E's absorption optical system, lets you work in the 440 to 236 mμ range and change wavelengths during the run. What the Scanner sees is recorded virtually as it happens.

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Also new—stronger forces. Two new titanium rotors have been built for these multicell runs. For five-cell runs, there is the new six-hole An-G Ti Rotor. Since it is titanium, it can be operated at higher speeds than its aluminum counterpart, and can generate as much as 170,000 *g* at the centers of the cells.

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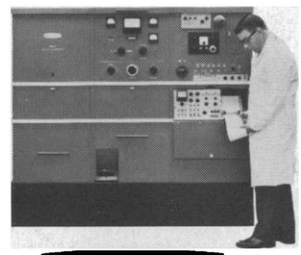
Literature available. If you would like more information about today's Model E and accessories for it, we will be pleased to send you literature. Simply write, on your letterhead, to Spinco Division. You might also like to be on the mailing list to receive *Fractions*, a publication sent to users of Beckman instruments for biochemical research. If so, mention *Fractions* in your letter, and we will add your name and send a recent issue which features an excellent review of sedimentation equilibrium.



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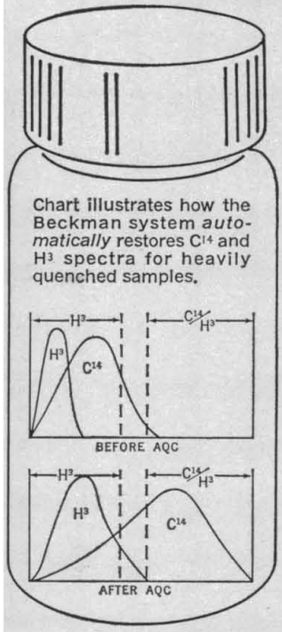

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SCIENCE

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COVER

Charge transfer between raindrops. The light produced at the points of contact of the water drops is the integrated effect of electrical discharges resulting from the collision of about 200,000 pairs of droplets (radius, 80 microns) during an 11-second exposure. The highlight in the center of each droplet is an image of a single flash of the strobe light, which caught several pairs of the falling droplets. See page 1267. [J. D. Sartor and W. R. Atkinson, National Center for Atmospheric Research, Boulder, Colorado]

New opportunities in physical and occupational therapy

1. College program for occupational therapy majors. If you want to become a professionally qualified occupational therapist, the Army will start helping in your junior year. You can receive a monthly education subsidy while you complete your undergraduate studies at your present school. Then you'll study at one of the Army's modern hospitals in Washington, San Francisco or San Antonio. There you'll receive clinical training in occupational therapy to fully qualify you for military or civilian practice.

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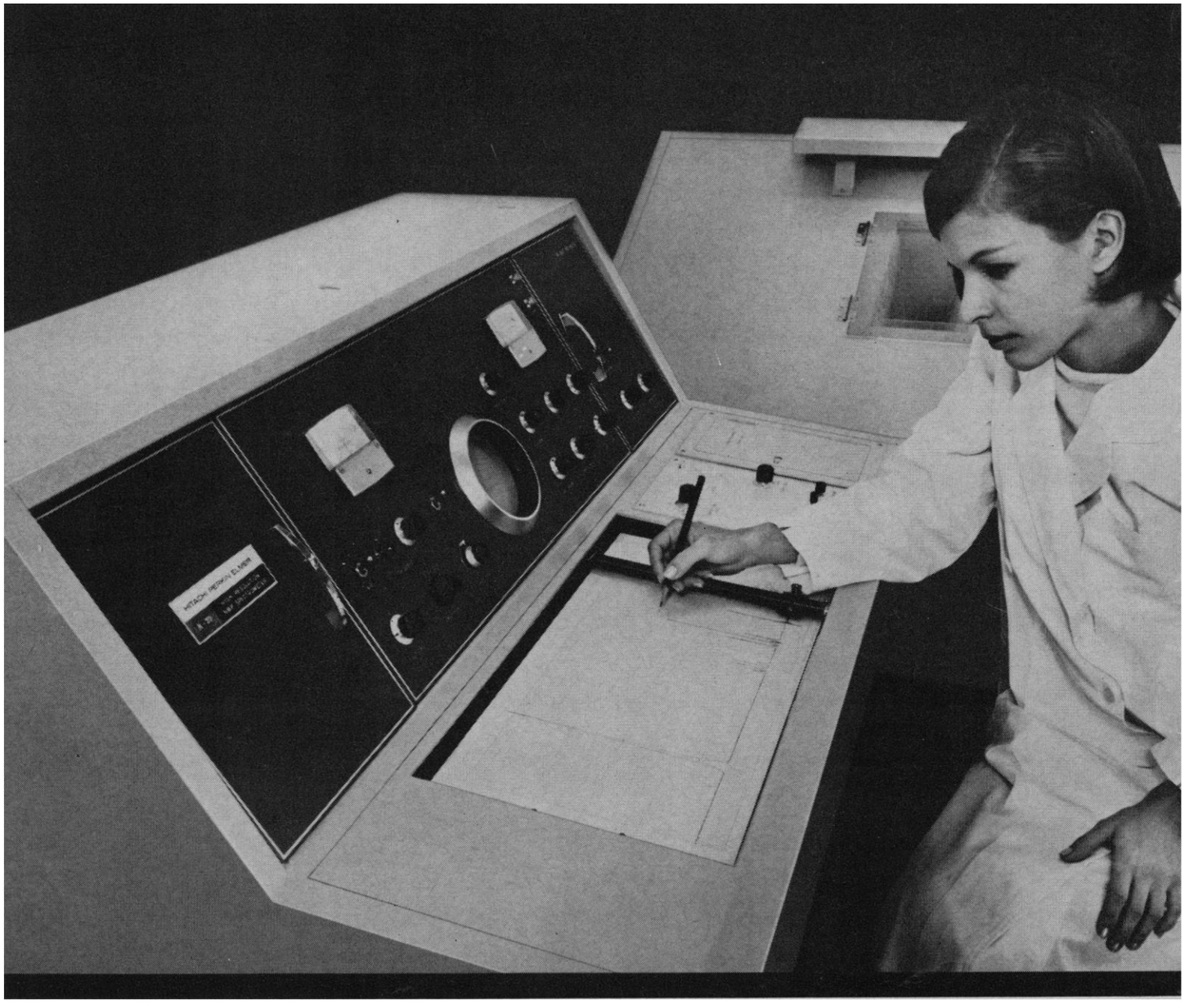

LET PERKIN-ELMER PUT THE CARBON BACK IN HYDROCARBON.

New permanent-magnet NMR offers easy interchange for study of all pertinent nuclei.

The Hitachi Perkin-Elmer Model R-20 is a versatile and stable 60 MHz high-resolution nuclear magnetic resonance spectrometer designed for simple operation. The R-20 is the only NMR spectrometer using a field-locked permanent magnet system for high reproducibility of spectral data recording. Both proton and ^{13}carbon NMR spectra can be obtained readily to provide more complete structural data on organic chemicals. The R-20 provides simple and rapid interchange units for study of all nuclei, including ^{13}carbon, fluorine, phosphorus and boron.

The Model R-20's thermostatted permanent magnet assures inherent field and resolution stability. It eliminates the need for a complex magnet power supply and heat-dissipation equipment, saving more than $1000 a year in operating costs and down time.

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Additional features include calibrated charts for all nuclei, precise chemical shift determination, and frequency sweep homo- and hetero-nuclear spin decoupling, which allows simplification of complex spectra.

For more information, including a brochure with spectra, write Magnetic Resonance Department, Perkin-Elmer Corporation, 723 Main Avenue, Norwalk, Connecticut 06852.

PERKIN-ELMER

Physicians entering practice are denied privileges in some hospitals until they belong to the local county medical society. Furthermore, the Joint Commission on Hospital Accreditation is controlled by the AMA, the American Hospital Assocation, and the American College of Surgeons. Without accreditation, hospitals are not approved for certain types of health insurance care, for federal funds for building (Hill-Harris funds) and are otherwise hampered. In addition, AMA membership is required for certification by some (not all) specialty boards. Thus, for one reason or another, many physicians eventually are forced to pay dues to the AMA in order to fulfill their primary obligation—which is to their patients. (It is well known that the AMA has ample funds for lobbying and public relations and does indeed serve its members well in these and in many other respects, such as group insurance.)

One admirable objective of all this is to maintain high standards of medical practice, but it remains to be seen whether this could be better accomplished by an agency other than the AMA. At present there is little or no control over the quality of medical practice outside hospitals, and little enough inside. A more subtle, less known objective of the AMA has been to protect the economic interests of its members, and in this it has been singularly successful. So, while there are many physicians who might wish to revolt against the AMA, when the chips are down, few will do so.

HERBERT L. JOSEPH
1516 Napa Street, Vallejo, California

The Student American Medical Association, although enjoying a close working relationship with the AMA as well as all other major medical organizations, is in no way financially or politically tied to it as Langer's description "junior AMA" would imply. . . . Langer also implies that SAMA and the Student Health Organizations are in opposition and working at cross purpose. She neglects to mention that the initial national SHO meeting was sponsored by SAMA at the University of Chicago in 1966, that many of the SHO groups are SAMA chapters that have elected to affiliate with both organizations, and that national SAMA has a formal liaison with the SHO. SAMA has indeed been "energized" with respect to community health programs by the impressive efforts of SHO

in this area, and we have established an ad hoc committee on community health problems to establish similar projects in the areas outside of California, New York, and Chicago where SHO has little representation. In addition, we will continue to represent responsibly our membership of 60,000 medical students, interns, and residents in the areas of evaluation and financing of medical education, international health, house staff salaries, the doctors draft, medical legislation, and any other pertinent concerns.

DAVID A. KINDIG
1424 East 58 Street,
Chicago, Illinois 60637

World Weather Watch

As a member of the U.S. delegation to the congress of the World Meteorological Organization, I found Walsh's article ("World weather watch: meteorologists of the world unite," 16 June, p. 1470) gave a good account of the actions taken to implement plans for the World Weather Watch. Unfortunately in his brief review of the development of the world weather programs, he has used confusing expressions such as ". . . bringing meteorologists and atmospheric scientists closer together . . ." and ". . . the meteorologists need the scientists. . . ." Most of the scientists working on the world weather programs *are* meteorologists. The World Weather Watch, conceived by the WMO, is under the direction of meteorologists employed by the governmental agencies. The special committee of the International Union of Geodesy and Geophysics and the International Council of Scientific Unions which has been working on the formulation of the Global Atmospheric Research Program also is made up largely of meteorologists. The major goals of GARP and WWW have a great deal in common. The former is chiefly concerned with developing a better understanding of the entire atmosphere. The WWW shares this goal, but also is aimed at improving weather service, particularly weather forecasting. The meteorological scientists involved recognize that success can be achieved only if the available talent is unified in this ambitious and worthwhile undertaking.

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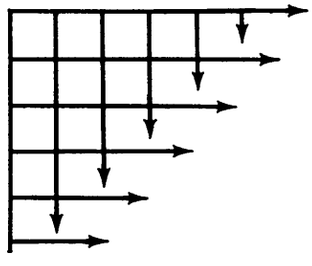

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Developed in the Laboratory of Cellular Physiology and Metabolism, National Heart Institute, National Institutes of Health, Bethesda, Maryland. Special thanks are due to Dr. William J. Dreyer, whose co-operation and suggestions are gratefully acknowledged by Gilson Medical Electronics.

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SCIENCE

Diminishing the Role of Sulfur Oxides in Air Pollution

Each year, in the United States, more than 20 million tons of sulfur are discharged into the atmosphere, most of it in the form of SO_2. This gas is slowly converted into sulfuric acid, which is corrosive to many materials, including metals, building stones, and clothing. The toxicity of SO_2 and H_2SO_4 to plants and animals is controversial, as is the effect of these compounds when they are inhaled along with other components of smog. Because of the complexities of long-term and synergistic effects, many years must elapse before precise conclusions can be reached concerning the role of the sulfur compounds. In the meantime, the public is becoming impatient with slow progress made in overcoming air pollution. Already, in various cities restrictions are being placed on the amount of sulfur fuel may contain.

Principal targets for such restrictions are electric power generating plants. These are a major source of air pollutants when they use coal or residual oil as fuel. Coal, the principal fuel, contains various quantities of sulfur; a typical amount is 3 percent. Concern about air pollution has been a factor in the sudden acceptance of nuclear energy. Unless the pollution problems attending use of coal are solved, the coal industry will face a gloomy future, caused in part by regulation, in part by competition from other energy sources.

Five means of meeting the sulfur pollution problem seem feasible. One is to use fuel containing only small amounts of sulfur. A second is to discharge the fumes from tall smokestacks (more than 200 meters high). If stacks are tall enough to pierce the inversion layer, the pollutants are thoroughly diluted before reaching the ground. A third method is to add a material such as powdered limestone to the flue-gas stream, following combustion, to convert the gaseous sulfur oxides into a solid form. A fourth is to convert the coal to gas and to remove the sulfur from the gas prior to combustion. A fifth method, which seems very interesting, is to pass the flue gases through a chemical processing plant, the sulfur being recovered in elemental form or as H_2SO_4. A number of variants of this method are under investigation. The U.S. Bureau of Mines has been conducting pilot-plant tests of an alkalized alumina process. Oxides of sulfur are removed from flue gas by absorption on a hot alkaline solid. The absorbent is regenerated with a reducing agent such as $H_2 + CO$, yielding H_2S as a product. The latter is readily converted to elementary sulfur. In a variant of this process, announced recently by Atomic International, a molten mixture of carbonates is used as the absorbent. Monsanto Chemical Company is active in the development of a catalytic oxidation process. Flue gas is freed from fly ash and passed over a catalyst bed containing V_2O_5, the SO_2 being oxidized to SO_3. This substance, on cooling, reacts wth water vapor to form H_2SO_4.

Both the sulfur and the H_2SO_4 are consumed on a large scale. The price of sulfur has advanced sharply during the last year and is currently quoted at close to $50 a ton. With present technology the value of the sulfur recovered from coal-fired power plants would about offset the cost of investment and operation of the processing plants. A combination of better technology with a higher price for sulfur may eventually convert a nuisance into a valued asset.—PHILIP H. ABELSON

This New Liquid Chromatography Detector System allows direct, quantitative analysis of:

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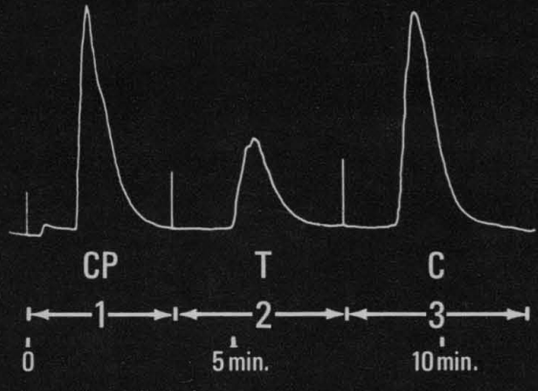
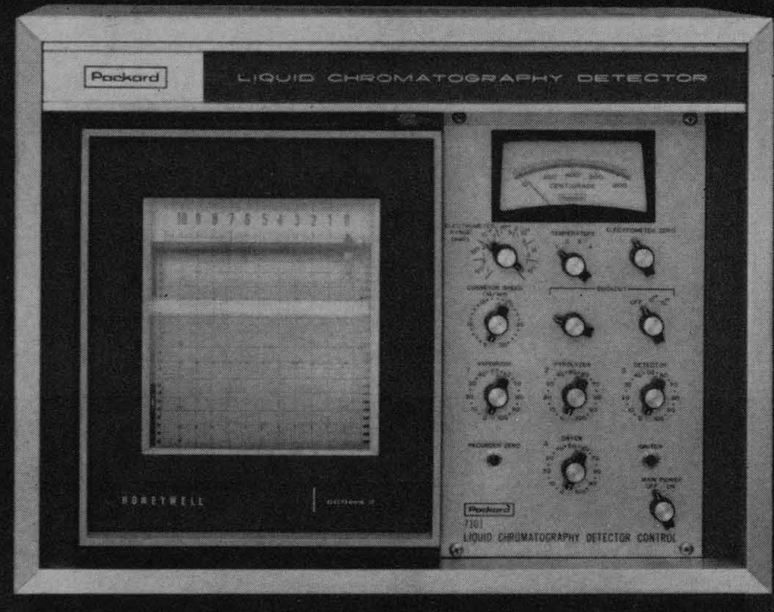
alkaloids	pigments	oils

"Pre-flame" pyrolysis provides high sensitivity and sharpens chromatogram peaks



Separation of cholesterol palmitate, triolein and cholesterol using three different solvents.



The Packard Model 7101 Liquid Chromatography Detector System enables you to analyze high molecular weight compounds without the need for time-consuming preparation of derivatives. A unique feature of this new system is Pre-flame Pyrolysis, our patented method of transforming liquid chromatography solutes into a gaseous state *before* they reach the hydrogen flame detector. The solute sample is carried on a reinforced nichrome helix through a controlled atmosphere furnace where pyrolysis takes place. Because the conveyor does not pass through the hydrogen flame, noise levels are extremely low . . . sensitivity unusually high.

Your Packard Sales Engineer can give you complete information. Call him, or write for Bulletin 1086U to Packard Instrument Company, Inc., 2200 Warrenville Road, Downers Grove, Illinois 60515, or Packard Instrument International S.A., Talstrasse 39, 8001 Zurich, Switzerland.

Packard

barriers to the transfer of molecules, but this mechanism has not been worked out satisfactorily.

The function of the normal and the abnormal placenta needs a great deal more study. Virtually nothing is known of the correlation between abnormalities in the placenta and abnormalities in the fetus. The site of origin of plasma cells and the production of antibodies in the human placenta as determined by biopsy, examination of delivered placentas, or by extrapolation from animal models, have yet to be ascertained.

One of the most promising animal models for human congenital malformations is the baboon. The gross structure of its placenta is comparable to the human. The production of phocomelia with thalidomide in doses similar to that recorded for human beings suggests that some functional aspects of embryogenesis may also be very comparable. The menstrual cycle has been well studied and precise dating of ovulation is relatively easy. Data are accumulating on normal embryogenesis in the baboon with descriptions of all stages from the blastocyst on. During the first 39 days of gestation the embryo appears identical to the human. While a healthy pregnant captive baboon is a relatively expensive, not to say large, experimental animal its disadvantages may well be offset by the possibility of extrapolating to man and by the confidence with which the pathology can be assessed.

DNA viruses may cause congenital abnormality through chromosome damage, such as breakage, rearrangement, nondisjunction or polymerization, in the gamete, in the zygote, and in the fetal somatic cells. This damage appears to begin with loss of contact inhibition of division followed, in a week or two in tissue culture, by a tremendous variation of the genome. None of these alterations are specific to viruses. Furthermore, many chromosomal aberrations appear to be of little moment. A dead skin cell sloughs, most abnormal sperm fail to fertilize, and only the chromosomal abnormalities in the ovum, perhaps, give rise to abnormalities.

Reproductive abnormalities are often best recognized epidemiologically. Using retrospective analyses testing and generating hypotheses, mitotic nondisjunction appears to be one possible common characteristic relating maternal age, increased risk of abortion, Down's syndrome and childhood leukemia. Sophisticated statistical techniques permit the evaluation of the significance of observed clusters of disease in time and in space. Simultaneous occurrence of diseases can suggest common etiologies. It can also permit observation of the onset and development of a disease such as leukemia through the identification of high-risk groups.

In considering any etiologic agent of congenital malformations one must look at the other manifestations of reproductive wastage, abortion, fetal death, and fetal infection. These may occur in the absence of direct fetal involvement, for instance, in response to change in placental function.

In the face of the hundreds of presently known viruses, potentially capable of producing teratogenic effects, precise identification of the genetic, chemical or physical mode of action of known viral teratogens would greatly assist in the identification of high-risk agents for epidemiologic and laboratory investigations. It is apparent that many different disciplines must contribute information and that new methods must be developed in seemingly unrelated fields before there will be any real breakthroughs in identifying and understanding viral etiologies of congenital malformations.

SHIELA C. MITCHELL
National Heart Institute, Bethesda, Maryland

GILBERT L. WOODSIDE
National Institute of Child Health and Human Development, Bethesda

Calendar of Events

Courses

Modern Developments in Low Speed Aerodynamics with application to VTOL, Tullahoma, Tenn., 25 Sept.–6 Oct. Fee: $300. *Deadline*: 18 Sept. (Director, Continuing Education, Univ. of Tennessee Space Institute, Tullahoma, Tenn. 37388)

Applied Transducer Workshop. Hopatcong, N.J., 30 Oct.–3 Nov. Instruction in instrumentation and process transducer performance, design, and application. Fee: $200. (Dr. S. D. Black, Center for Professional Advancement, P.O. Box 66, Hopatcong 07843)

Research and Development Management, Columbus (1st week) and Athens (2nd week), Ohio, 24 Sept.–6 Oct. For scientists and engineers with managerial responsibilties. Limited to 65 participants. (Director, Center for Management Development, College of Business Administration, Ohio University, Athens 45701)