SCIENCE

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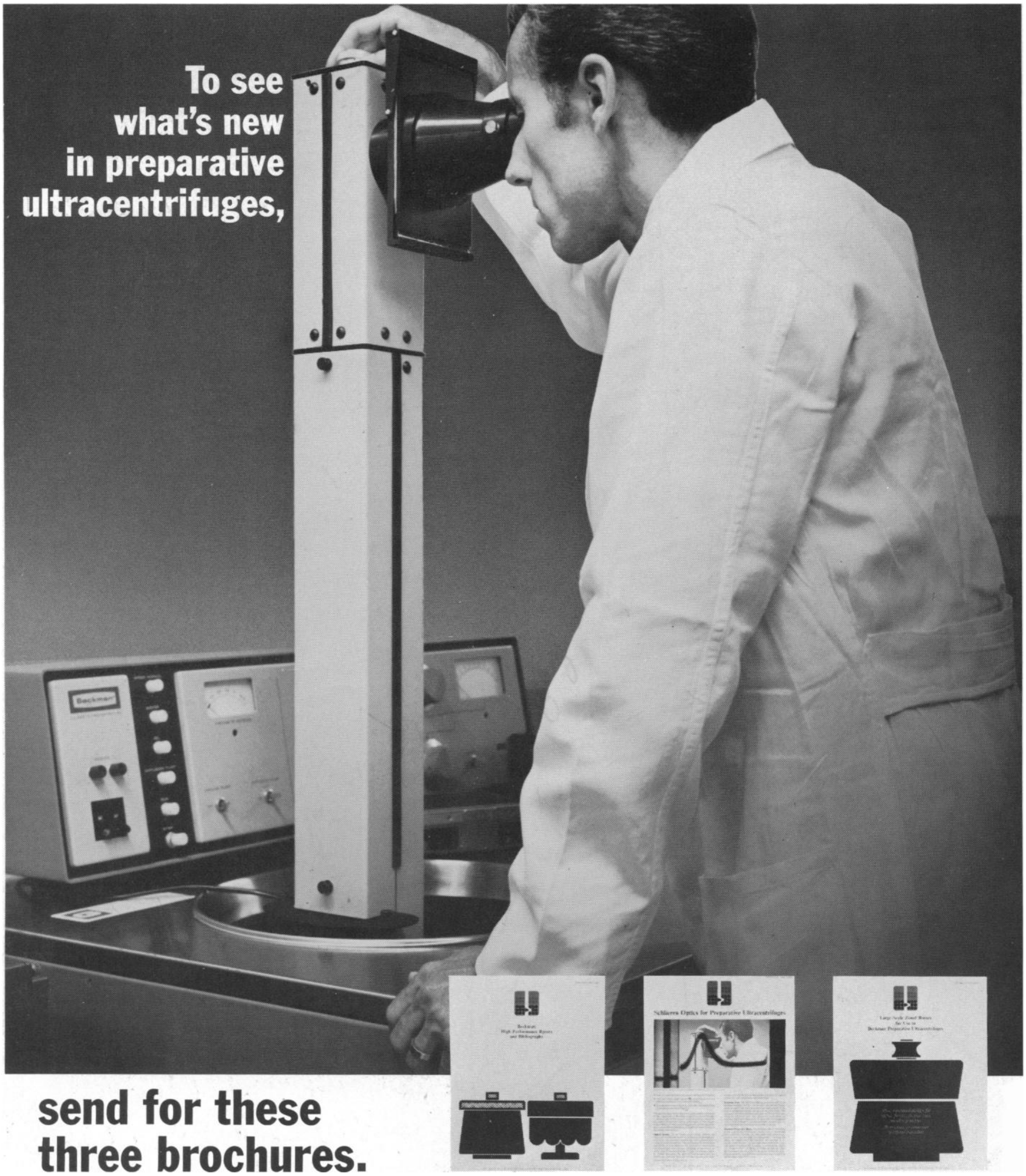
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



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COVER

Lightning flash strikes a European ash tree, just 60 meters from photographer's observation point. Strike occurred 23 August 1967. See page 666. [Richard B. Orville, State University of New York at Albany]

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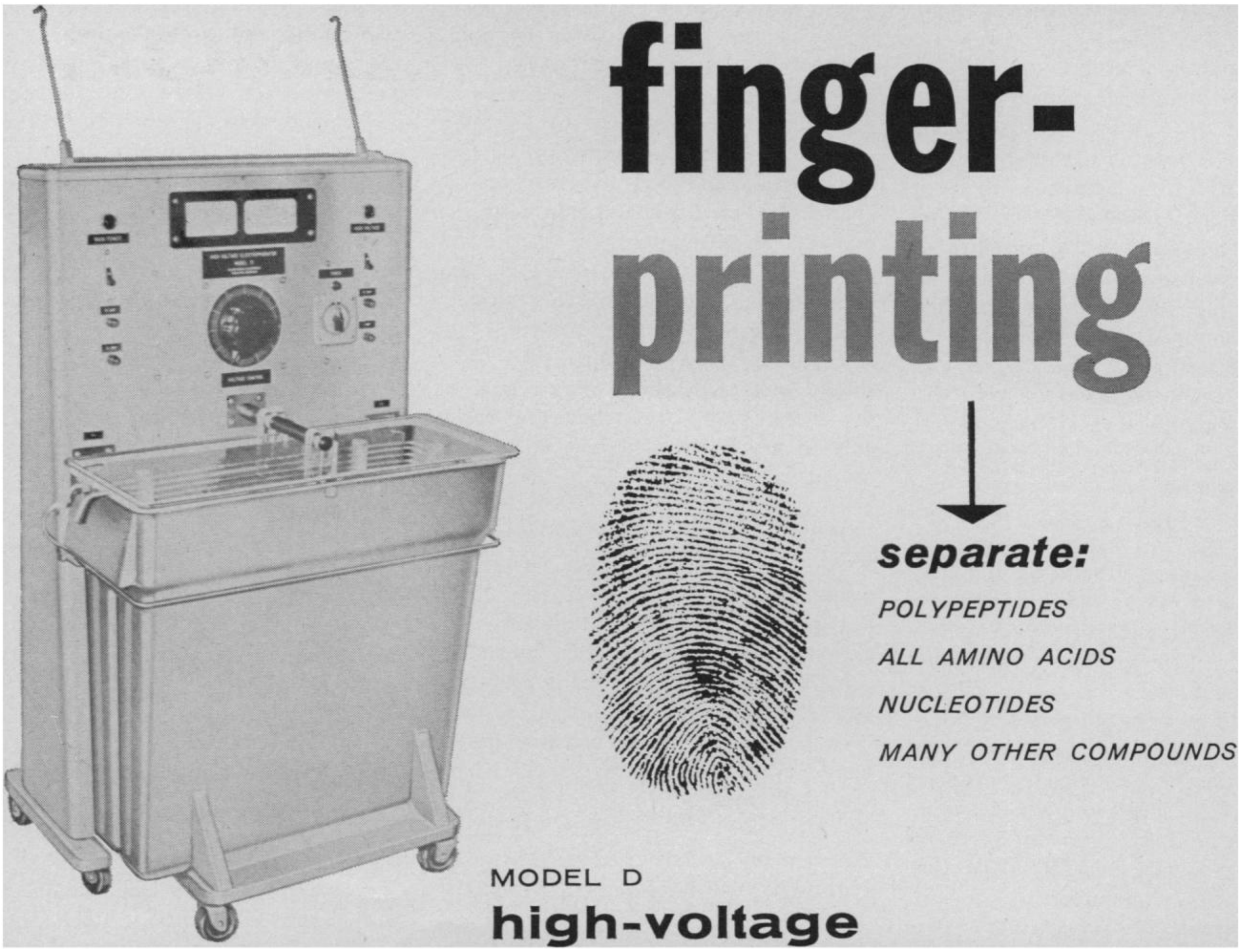

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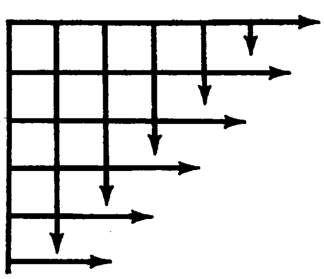

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Deep Earth Sampling

In 1961, the United States achieved a notable first by drilling in the deep sea bottom off Guadalupe Island in the Eastern Pacific. This work was preliminary to the Mohole Project, but in principle it demonstrated the feasibility of exploring the deep sea bottom generally. However, the Mohole Project became a center of controversy. For a time it appeared that others, notably the Sheik of Kuwait, might lead in exploiting the new opportunity. However, we were outfumbled, and in 1968 resumed leadership at a great frontier.

Several factors contributed to recovery from the Mohole fiasco. Leading oceanographers suppressed long-standing rivalries to form a Joint Oceanographic Institution's Deep Earth Sampling (JOIDES)* program and outlined objectives for a drilling project. Scripps was selected as the prime contractor, and it prepared a well-conceived proposal calling for drilling at 55 sites, in the Gulf of Mexico, the Atlantic Ocean, and the Pacific Ocean, during an 18-month period. Despite the damage the National Science Foundation had suffered from Mohole, the foundation courageously allocated $12.6 million to the new venture. Scripps then selected the Global Marine Company as drilling contractor. In 8 months this company built a 10,000-ton ship having many advanced design features; the ship can drill and obtain cores from 2,500 feet (750 meters) into sediment beneath 20,000 feet of water. A major success came last August, near the start of the program, in drilling in the Gulf of Mexico. Earlier oceanographic expeditions had discovered under deep water some 170 dome-like structures reminiscent of salt domes of the southern United States and Mexico. Cores from one of these knolls, obtained at a site in 11,746 feet of water, contained materials typically found at the top of many salt domes, including cap rock of $CaSO_4$, free sulfur, and petroleum. Other results from drilling, at seven sites, included discovery of Jurassic sediments (150 million years old), the oldest sedimentary rock yet found in the deep ocean; the finding that much of the deep sea sediments consists of turbidites (produced by a mechanism analogous to mud flows on land); determination that Horizon A, in the areas drilled, consists of a flinty chert; and the observation that, in contrast to sediments now at the ocean interface, many of the cores contained reduced iron.

In the coming months, the drilling program will illuminate a number of major problems. For example, the Atlantic Ocean is thought by some geologists to have been essentially unchanged for much of the earth's history. Many others consider this ocean to be a relatively young feature formed in the wake of migrating continents. Cores from the sediments could support one of these views or an entirely new hypothesis.

The Ocean Sediment Coring Program leans heavily on the accumulated knowledge of previous decades. That knowledge is extensive, for the Lamont Geological Laboratory alone has logged nearly a million miles of deep sea expeditions. Measurements from shipboard have provided much information, while posing puzzles that could be solved only by drilling. Each of the sites chosen was selected because it could provide urgently desired information.

In view of the successes already achieved, with leading oceanographers cooperating well together and with Scripps implementing a well-organized and well-equipped program, prospects for an outstandingly successful project appear excellent.—PHILIP H. ABELSON

* The original JOIDES group consisted of the Institute of Marine Sciences of the University of Miami, Lamont Geological Observatory of Columbia University, Woods Hole Oceanographic Institution, and Scripps Institution of Oceanography of the University of California. In the summer of 1968 the University of Washington was added.

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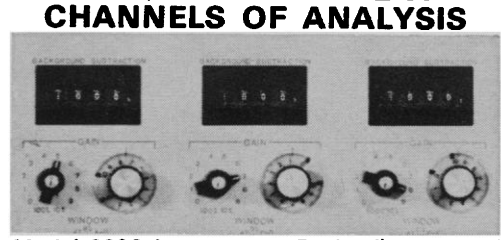

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Exogenous and endogenous progesterone stimulates embryo growth up to a certain point, but is deleterious to embryonic survival thereafter. For example, embryonic mortality in sheep increases as the total quantity of progesterone per embryo increases. In rats, steroid administration corrects the effects of reduced caloric intake on pregnancy and enhances placental growth, but does not improve nitrogen balance or liver protein levels.

The time when estrus and ovulation occur may be controlled readily with progestins given orally, intravaginally, by subcutaneous implant, or by injection. The manner of administration, and the type and dose of steroid used, affect the precision of the response, the frequency of ovulation without estrus, and subsequent fertility. All treatments cause some subfertility at the first estrus after treatment due to faulty sperm transport and survival in the female reproductive tract, and to endocrine imbalance. The stimulatory effect of chorionic gonadotropin on urinary steroid output during periods of inhibition of estrus suggests that progestins act at the hypothalamic-pituitary level, suppressing gonadotropin secretion. Pregnant mare's serum gonadotropin can be used to advance the breeding season of sheep. However, the problem of breeding sheep during anestrus or lactation remains unsolved.

The fertility of bull semen improves for a time after collection, reaches an optimum, and then declines as the spermatozoa age. Embryo mortality is inversely related to semen fertility. The optimum fertility, and thus minimum embryonic mortality, for sperm stored at 4°C is on the day after collection. The early improvement in fertility may be due to selective death of spermatozoa containing aberrant chromatin. The decrease in fertility and the increase in early embryonic death found after long storage periods may be due to disturbances of the genetic information system.

Several techniques have been developed for freezing ram semen in colored plastic straws, and bull and stallion semen in pelleted form. Ram semen may also be frozen by the pelleting method if freezing is rapid, if a low concentration of glycerol in a simple medium is used, and the equilibration period is short. There are striking seasonal and individual variations in the freezability of stallion semen. Polyols like xylitol are used for the protection of bovine semen during freezing.

Bull and buffalo semen is preserved at room temperature in a coconut water diluent. The coconut water is collected in Kenya, lyophilized in ampoules, and sent to Germany, where it is stored up to 1 year before it is used. Such semen is reliable for at least 4 days if sufficient attention is paid to laboratory hygiene and the semen is not kept at temperatures below 12°C. This method is being used to increase animal protein supplies of developing countries by eliminating the need for refrigerated semen in artificial insemination programs.

The proceedings of the congress, edited by Professor Charles Thibault, will be published by Station Physiologie Animale, C.N.R.Z., 78 Jouy-en-Josas, France. The site of the seventh congress in 1972 will be West Germany.

E. S. E. Hafez

Washington State University, Pullman, Washington

Calendar of Events—Courses

Mass Spectrometry—Principles and Applications, Ledgewood, N.J., 2–6 December. Will provide a basic understanding of the theory of operation and function of mass spectrometers. Will include functions of major assemblies; mechanisms of ion formation; application in inorganic, forensic medical, and geological fields; principles of focusing; and interpretation of cracking patterns. *Fee*: $190. (Center for Professional Advancement, P.O. Box 66, Hopatcong, N.J. 07843)

Oceanography—Tour to Coasts of the World: South Pacific, 11 January–1 February. This is a noncredit course which will cover intertidal and nearshore environment, Great Barrier Reef, coral atolls, coastal engineering, tropical marine biology, seismic sea waves, volcanoes, fjords, and beaches. (University of Washington, Division of Evening and Extension Classes, Seattle 98105)

Photochemistry, Moffett Field, Calif., 11–13 December. Intended for scientists, enigneers, medical researchers, students, and teachers, the program will emphasize a basic understanding of chemical and physical processes affected by light, including the methods of kinetics and quantum mechanics. The latest techniques for generating, detecting or measuring visible, ultraviolet, and vacuum ultraviolet radiation will also be summarized, with descriptions drawn from research in polymers, medicine, space sciences, and atmospheric photochemistry. (Letters and Science Extension, University of California, Berkeley)

Communication Systems, Washington, D.C., 9–13 December. Modern communication theory and its applications to communication systems, such as radar, satellite communications, and point-to-point digital transmission. (J. E. Mansfield, School of Engineering and Applied Science, George Washington University, Washington, D.C. 20006)