added to a growing conviction that in some instances silver iodide seeding may increase precipitation and sometimes decrease it, depending on various factors, particularly the cloud-top temperature.

3) *Hail modification.* An operational hail-suppression project in Kenya, Africa, shows apparent positive results of about 70-percent reduction in hail damage to the tea crop as the result of one season's seeding by aircraft. Data on hail suppression gathered in North Dakota during a 2-year period indicates a statistically significant reduction between the hail energy received on the target area compared with the control area.

4) *Rainmaking.* The practical application of cloud-seeding techniques in several regions in Australia, where clouds suitable for seeding are known to occur, is being carried out by State Agricultural and Public Works departments. The departments have responsibility for water resources including water distribution and use.

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Hemoproteins

A Hemoprotein Workshop was held at the National Institutes of Health, Bethesda, Maryland, 29–30 April 1968. The object of the workshop was to bring together about a dozen leaders in the field to discuss current concepts of hemoprotein structure and function and perhaps speculate about promising directions for future work. The meeting was chaired by J. T. Edsall, who also gave a short introductory history of hemoglobin chemistry.

G. Braunizer (Max-Planck Institut für Biochemie, Munich) summarized his recent findings on polymorphism of insect hemoglobins of *Chironomus thummi thummi, tentans, pallidivitans*, and *anthracinus*. Generally speaking the polypeptide chains are shorter than those of mammalian hemoglobins; amino terminal residues are different from mammalian residues (glycine rather than valine). The greatest difference occurs in the region near the C-terminal residues because of deletions. Braunitzer concluded his lecture by summarizing a recent investigation by Tichy, who has identified the loci of hemoglobin synthesis in the giant chromosomes of the salivary gland. *Chironomus*, like *Drosophila*, has but four chromosomes. Tichy is said to have found the locus of hemoglobin genes in chromosome No. III.

Max F. Perutz discussed the structure of the molecule of horse hemoglobin at a resolution (2.8 Å) higher than heretofore reported. He showed, with the aid of stereoprojection, indicated contacts between the globin and the heme group, between the alpha-1 and beta-1 chains, between alpha-1 and beta-2, and finally between beta-1 and beta-2. He called our attention to the fact that we do know many details of the structure of the molecule, but its functions, such as in the Bohr effect and the heme-heme interactions, are still not explained, nor do we understand the mechanism of alkaline denaturation.

Jeffries Wyman (Istituto Regina Elena, Rome) discussed hemoglobin as a complex feedback and control mechanism in the blood stream. He formulated linked functions and applied them to the hemoglobin molecule. He showed how binding of proton, oxygen, carbon monoxide, and aggregation effects are linked in the hemoglobin molecule.

Q. H. Gibson (Cornell University, Ithaca) discussed kinetics of hemoglobin reactivity. He summarized the photolysis of HbCO, which he investigated with F. J. W. Roughton a number of years ago. He also presented his more recent work on the mechanism of ligand formation. His findings suggested that in -SH hybrids there is mutual influence and that hemes of the beta chain modify the behavior of the alpha chains, showing that the CO bonding cannot depend on the bonding of Fe to histidine in the beta chains.

E. Margoliash (Abbott Laboratories, North Chicago) presented his recent formulation on evolutionary variability of cystochrome c. The concept has been developed in collaboration with W. M. Fitch (University of Wisconsin, Madison). He stressed the definitions of the terms homologous (structures derived from common ancestral form) and analogous (structures which are similar even though different in origin). The subject is much too complex to be summarized in a few sentences; however it is interesting to note that the evolutionary "tree" formulated by these investigators appears to be acceptable to biologists.

Short but witty concluding remarks were made by R. D. Owen (California Institute of Technology, Pasadena) who sees parallels between biology and hemoproteins, anatomy corresponding to structure, and physiology to functions. Genetics and even behavior (conformational changes) were paralleled.

The workshop was sponsored by the National Institute of Arthritis and Metabolic Diseases.

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Calendar of Events

Courses

Coastal Engineering Environment, Los Angeles, Calif., 4–15 Nov. Intended to acquaint participants with the latest methods in coastal engineering. For engineers interested in coastal, oceanographic, and offshore petroleum engineering. The course will cover fundamental background in hydrodynamics, physical oceanography, and coastal morphology as well as the design of coastal installations and structures, including practical methods of calculation, methods of funding, and economical justifications. *Fee*: $375. (P.O. Box 24902, Engineering and Physical Sciences Extension, University of California Extension, Los Angeles 90024)

Remote Sensing for Geology and Hydrology, Washington, D.C., 7–9 Nov. It will cover the use of electromagnetic radiation including ultraviolet, visible, near infrared, thermal infrared, and microwave (passive and active radar) in solving geologic and hydrologic problems. (Dr. J. L. Snyder, American Geological Institute, 1444 N St., NW, Washington, D.C. 20005)

Interpretation of Complex Arrhythmias, Chicago, Ill., 9–14 Dec. Intended for experienced electrocardiographers. (Miss Beverley Petzold, Executive Secretary, Cardiovascular Institute, Michael Reese Hospital and Medical Center, Chicago 60616)

Marine Soil Mechanics and Foundation Engineering, Los Angeles, Calif. 18–22 Nov. For scientists and engineers who are engaged in or anticipate working on engineering projects in deep waters of the sea, where some understanding of the physical behavior of bottom sediments is of importance. The course will cover an introduction to aspects of soil mechanics and marine geology currently considered of importance to the design and construction of foundations at sea, and discussions of unique problems arising from operational activities on the bottom. *Fee*: $275. (P.O. Box 24902, Engineering and Physical Sciences Extension, University of California Extension, Los Angeles 90024)

Identification of Organisms Important in Pollution, Atlanta, Ga., 4–21 Dec. Sponsored by the Federal Water Pollution Control Administration. Stipends are available to help defray expenses; there will be no charge for the course. The taxons to be covered include the algae, fungi, crustacea, mayflies, stoneflies, caddisflies, oligochaetes, fish, chironomids, and mollusks. (Dr. Fred K. Parrish, Program Director, Department of Biology, Georgia State College, 33 Gilmer St., SE., Atlanta 30303)