cytochrome *c* (that is, a lysine or histidine to methionine sulfur) was suggested, but appears unlikely in view of rapid oxidation of cytochrome *c* at 34°K. The interpretation of the optical rotatory dispersion measurements of cytochrome *c* resulted in an active discussion by a number of investigators—each with his own approach to the use of these measurements for detailed examination of this hemoprotein.

P. Strittmatter then described studies on cytochrome b_5 illustrating the role of the bound metalloporphyrin in stabilizing the heme protein conformation in which a very significant portion of the amino acid residues are exposed to the medium and are chemically reactive. Heme analogs, chemical modification of the apoprotein, and the kinetics of recombination of a functional reactive cytochrome b_5 all point to the importance of heme binding in maintaining the cytochrome structure.

Ligand binding and its relationship to possible mechanisms of oxidase function was described by E. C. Slater. Discrepancies in the affinity of cytochrome oxidase for ligands such as fluoride, cyanide, or azide, as determined spectrophotometrically by alteration in absorbance with the concentrations of ligand known to inhibit the enzymatic activity, leave unresolved the mechanism of interaction. M. R. Lemberg then presented data supporting the existence of a new compound on the so-called "oxygenated" intermediate form of cytochrome a_3 of cytochrome oxidase. There is, however, no evidence at present that the molecular O_2 is contained in the compound. R. W. Estabrook discussed changes in optical absorbance spectra and correlated EPR spectra during substrate (barbiturates, steroids, and others) interaction with cytochrome P-450. The substrate-cytochrome P-450 compound formed was presumed functional during mixed function oxidation reactions. The discussion of oxidases was concluded by the intriguing results obtained by M. Kamen on CO interaction with the bacterial cytochromes RHP and O. He postulates a long-range interaction of CO and Fe that is not spectroscopically operative. The existence of two forms of CO derivatives, as revealed by kinetic analysis, points to the complexity of the reaction.

In an attempt to clarify the mechanism of electron transfer reactions in cytochrome, A. Kowalsky described an NMR study of the complexing of various paramagnetic metal ions with methionine and its derivatives in connection with the interest in methionine as a possible sixth ligand of the heme prosthetic group of cytochrome *c*. Specific interaction between the thio-ether linkage and copper, and between the thio-ether linkage and the iron of a heme octapeptide of cytochrome *c*, was detected by observation of the CH_3-S resonance. The possibility of a hyperfine contact interaction between the metal and the CH_3-S was investigated. An interesting application of the laser to the study of photosynthesis was presented by D. DeVault, who with Chance observed that a cytochrome was oxidized in *Chromatium* bacteria with a half-time of reaction of 2 μsec at room temperature after absorption of a quick pulse of laser light. On the basis of the nearly zero activation energy ($<$ 80 cal) observed at 120° to 35°K, they proposed an electron tunneling mechanism for this light-induced oxidation of the cytochrome. The existence of rapid cytochrome oxidation at 35°K limits the range of feasible reaction mechanisms.

The colloquium concluded with a discussion of theoretical aspects led by R. J. P. Williams. He succinctly defined the limits of our present understanding of the electronic structure of iron porphyrins and the need for single crystal Mössbauer and EPR data. In addition Williams described the need for more detailed information in order to extend our understanding of the role of nonligand groups of the protein and their influence on interactions with the heme. This could be obtained from ultraviolet spectroscopy and circular dichroism, but caution is necessary in interpreting the data for ligand replacement and ring or conformational changes. Subsequent to answering these questions, Williams sought answers as to how entering reactants, such as electrons, O_2, H_2O_2, and other ligands, alter the geometry of the molecules interacting. Of primary concern is the question of whether the oxidation state of the hemoprotein need only be defined in terms of iron. The contribution of M. Gouterman supported the suggestion that one must consider, from quantum mechanical calculations, not only the iron but the whole system—that is, iron, porphyrin, ligands, protein groups, and substrates.

The free exchange of data and ideas among the participants representing a variety of approaches to this study produced an intensely stimulating colloquium. It is encouraging that the current research in the area of hemes and hemoproteins retains the vigor established by the early investigators.

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Leibniz Commemoration

On 12 March 1966 a symposium was held at the Polytechnic Institute of Brooklyn to commemorate the 250th anniversary of the death of Gottfried Wilhelm Leibniz, surely one of the most remarkable men who ever lived. Held in conjunction with the establishment of a new division of humanities and social sciences, it was the first of a series of symposiums on the interrelatedness of human knowledge which are designed to encourage dialogue between members of various disciplines. As planned, speakers and audience were drawn from a wide spectrum of interests, ranging at least from neurophysiology to English literature.

In the opening lecture of the morning session, chaired by D. J. deSolla Price of Yale, J. Agassi of Boston University showed that Leibniz's concepts of space and time as relations of order between things and events had been long neglected in the scientific tradition except by Kant and Boscovich. Observing that Einstein himself had held these concepts superior to Newton's concepts of absolute space and absolute time, he proceeded to show that Leibniz's ideas were partly responsible for the growth of the tradition of differential geometry and that of field theory in physics.

C. Iltis of the University of Wisconsin clarified the dispute between Leibniz and the Cartesians on the nature of the *vis viva*. She showed that it was not, as is commonly supposed, a mere battle of words in which the two concepts which we now call momentum and kinetic energy were confusingly discussed under the single concept of force, but rather a more fundamental disagreement on the nature of force itself. For Leibniz, what was real in nature was primitive force or striving, while motion

and extension, the essence of nature for the Cartesians, were to him simply relations and not realities at all.

Fundamental reasons for the limited extent of Leibniz's influence on mathematics, despite his great talent, were stressed by U. Merzbach of the Smithsonian Institution. Leibniz had few students, although he sought them, traveled frequently, and was occupied with a host of other projects. G. de Santillana of the Massachusetts Institute of Technology commented briefly on Leibniz's intense passion for intellectual universality.

K. H. Niebyl of Temple University observed that the unity of Leibniz's thought, which has been sadly mutilated by increasing specialization among scholars, might best be appreciated from the vantage point of the sociology of knowledge. C. J. Friedrich of Harvard pointed out that Leibniz, like almost every other great philosopher, was deeply concerned with the political crises of his day and showed that Leibniz's interest in reconciling the Christian churches in Europe was consistent with the ameliorating optimism of his philosophy. However, in contradistinction to most of the leading political theorists of the 17th century, Leibniz was not a thoroughgoing supporter of the nascent nation state, but rather stressed the constitutional growth of smaller political units such as the free cities as the most promising path of political and socioeconomic development.

P. Wiener of the City University of New York commented on the breadth of Leibniz's views, in particular on his ability, rare in his time, to appreciate non-European cultures on their own terms, thus approaching the position of cultural relativism in anthropology. R. Cohen of Boston University noted that Leibniz's philosophy, like Hegel's, was capable of at least several interpretations.

In a brilliant presentation that galvanized the audience despite the late hour, J. Lettvin of M.I.T. demonstrated a fascinating parallel between propositions 15 to 17 in Leibniz's *Monadology* and current conceptions of the functioning of the human nervous system. A strikingly eloquent impromptu summary by J. Bronowski ended the formalities, but discussion continued unabated during the reception that followed.

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Forthcoming Events

June

13–20. American Soc. of **Limnology and Oceanography**, Seattle, Wash. (H. Curl, Jr., Dept. of Oceanography, Oregon State Univ., Corvallis)

14–16. **Materials**, 3rd intern. symp., Berkeley, Calif. (J. A. Pask, Dept. of Mineral Technology, Univ. of California, Berkeley)

14–17. Applied **Mechanics**, natl. congr., Univ. of Minnesota, Minneapolis. (R. Plunkett, 107 Aero Bldg., Univ. of Minnesota, Minneapolis 55455)

15–17. **Communications**, conf., Inst. of Electrical and Electronics Engineers, Philadelphia, Pa. (A. E. Joel, Room 2G-330, Bell Telephone Laboratories, Holmdel, N.J.)

15–22. **Science** Seminar, Air Force Office of Scientific Research, Albuquerque, N.M. (W. J. Price, Air Force Office of Scientific Research, Washington, D.C.)

17–18. American **Rheumatism** Assoc., Denver, Colo. (G. W. Speyer, 1212 Sixth Ave., New York 10036)

19–22. **Botanical** Soc. of America, Northeast sect. and **Torrey Botanical Club**, summer field mtg., Univ. of Tennessee, Knoxville. (R. K. Zuck, Dept. of Botany, Drew Univ., Madison, N.J.)

19–23. American **Nuclear** Soc., 12th annual mtg., Denver, Colo. (Executive Secretary, 244 E. Ogden Ave., Hinsdale, Ill.)

19–24. American Soc. of **Medical Technologists**, Los Angeles, Calif. (R. Matthaei, Suite 25, Hermann Professional Bldg., Houston, Tex. 77025)

19–25. **Herpetologists' League**, Miami, Fla. (F. B. Turner, Laboratory of Nuclear Radiation and Biology, University of California, Los Angeles)

19–25. American Soc. of **Ichthyologists and Herpetologists**, annual mtg., Miami, Fla. (The Society, Div. of Reptiles, U.S. Natl. Museum, Washington, D.C. 20561)

20–22. **Colloid and Surface Chemistry** Div., American Chemical Soc., 40th natl. symp., Univ. of Wisconsin, Madison. (E. Hutchinson, Dept. of Chemistry, Stanford Univ., Palo Alto, Calif. 94300)

20–22. American **Dairy Science** Assoc., Oregon State Univ., Corvallis. (E. O. Herreid, Station A. Box 250, Champaign, Ill.)

20–22. American **Malacological Union**, Pacific Div., conv., Univ. of Washington, Seattle. (Mrs. E. Marshall, 2237 NE 175 St., Seattle)

20–22. **Organic Scintillators**, symp., Argonne, Ill. (D. L. Horrocks, Chemistry Div., Argonne Natl. Laboratory, 9700 S. Cass Ave., Argonne 60440)

20–22. American **Physical** Soc., Minneapolis, Minn. (R. G. Sachs, P.O. Box 344, Argonne, Ill.)

20–23. American Soc. for **Engineering Education**, 74th annual mtg., Washington State Univ., Pullman. (L. Winner, 152 W. 42 St., New York 10036)

20–24. **Air Pollution Control** Assoc., 59th annual mtg., San Francisco, Calif. (A. H. Batchelder, California Research Corp., 200 Bush St., San Francisco 94120)

20–24. **Crystal Growth**, intern. conf., Boston, Mass. (Secretary, Crystal Growth Conference, 40 Acorn Park, Cambridge, Mass. 02140)

20–24. Determination and Applications of **Radial Velocities**, symp., Toronto, Ont., Canada. (R. M. Petrie, Dominion Astrophysical Observatory, R. R. 7, Victoria, B.C., Canada)

21–22. **High Lysine Corn**, conf., Purdue Univ., Lafayette, Ind. (Div. of Conferences and Continuation Services, Purdue Univ., West Lafayette, Ind. 47907)

21–23. Precision **Electromagnetic Measurements**, 5th biennial conf., Boulder, Colo. (J. Cronland, Bureau of Continuation Education, 328 University Memorial Center, Univ. of Colorado, Boulder 80304)

22–24. **Calorimetry**, 21st conf., Boulder, Colo. (O. J. Kleppa, Inst. for the Study of Metals, Univ. of Chicago, Chicago, Ill. 60637)

22–24. **Heat Transfer and Fluid Mechanics**, inst., Univ. of Santa Clara, Santa Clara, Calif. (J. A. Miller, Dept. of Aeronautics, U.S. Naval Postgraduate School, Monterey, Calif.)

22–24. Germinal Centers of **Lymphatic Tissue**, conf., Bern, Switzerland. (H. Cottier, Inst. of Pathology, Freiburgstr. 30, 3008 Bern)

22–24. **Quantum Optics**, 2nd conf., Univ. of Rochester, Rochester, N.Y. (R. H. Picard, Optical Physics Laboratory, Air Force Cambridge Research Laboratories, Hanscom Field, Bedford, Mass.)

22–24. **Wood Chemistry**, 2nd Canadian symp., Ste. Marguerite, P.Q. (Chemical Inst. of Canada, 48 Rideau St., Ottawa 2)

22–25. **Endocrine** Soc., 48th annual mtg., Chicago, Ill. (The Society, 1200 N. Walker, Oklahoma City, Okla.)

23–25. **Carotinoids Other than Vitamin A**, conf., Trondheim, Norway. (N. A. Sorensen, Norwegian Inst. of Technology, Trondheim)

23–25. **Nuclear Energy**, 11th intern. congr., Rome, Italy. (Secretariat, Comitato Nacionale per l'Energia Nucleare, Via Belisario, 15, Rome)

23–25. National Soc. of **Nuclear Medicine**, 13th annual mtg., Philadelphia, Pa. (The Society, 333 N. Michigan Ave., Chicago, Ill. 60601)

23–25. **Obstetrics and Gynecology**, 14th Scandinavian congr., Oslo, Norway. (K. Björo, University Clinic of Obstetrics and Gynecology, Oslo)

23–26. **Nutritional and Metabolic Maladies**, European congr., Vittel, France. (F. Dumez, Soc. Général des Eaux Minérales de Vittel, 44, avenue George V, Paris 8, France)

23–25. **Biomedical Engineering**, symp., Milwaukee, Wis. (H. S. Geer, 617 N. 13 St., Milwaukee 53233)

24–25. Naturally Occurring **Sulphur Compounds**, conf., Copenhagen, Denmark. (A. Kjaer, Royal Veterinary and Agricultural College, Copenhagen V)

25–26. **Drug Information** Assoc., annual mtg., Chicago, Ill. (E. Conrad, American Medical Assoc., Chicago)

25–2. **Microcirculation**, 4th European conf., Cambridge, England. (P. A. G. Monro, Anatomy School, Univ. of Cambridge, Downing St., Cambridge)

26–28. Society for **Investigative Dermatology**, Chicago, Ill. (G. W. Hambrick, Jr., 3400 Spruce St., Philadelphia, Pa.

26–29. American Soc. of **Agricultural**