Meetings and Societies

Origin of Life

An international symposium on the Origin of Life on Earth was held in Moscow, U.S.S.R., 19–24 August 1957. The symposium was organized by the Academy of Sciences of the U.S.S.R. under the auspices of the International Union of Biochemistry. The general chairman of the conference was A. I. Oparin, author of the book *The Origin of Life on Earth,* which appeared recently in its third edition. A full publication comprising the papers and discussion at the symposium is in preparation.

The group from the United States was the largest of those from any of the 17 foreign countries represented, the total being over 40 scientists from outside the U.S.S.R. The American participants were Melvin Calvin, Erwin Chargaff, Sidney W. Fox, Heinz Fraenkel-Conrat, Norman H. Horowitz, Stanley L. Miller, Alfred E. Mirsky, Linus Pauling, Stanley Scher, and Wendell M. Stanley; Christopher Reid was present from Canada. Stanley and Fox were delegates from the National Committee of Biochemistry of the United States. Calvin presided at the closing session, at which it was resolved to request the International Union of Biochemistry to hold this subject on its agenda for future symposia.

In the first session, various ideas concerning the primitive atmosphere, hydrosphere, and lithosphere were discussed. Much of this bore on the origin of petroleum as well as on the origin of life, and the notion of an abiogenic origin of petroleum received renewed attention. V. A. Sokolov attempted to trace the earth through its stages of formation, warming, cooling, and biogenesis. J. D. Bernal gave a particularly lucid analysis of the component problems in the study of life's origin. During the discussion, Horowitz developed the point of view that the genes are the only living parts of the cell, everything else being products of genic activity. A. E. Braunstein argued, however, that only the entire cellular system shows the properties of life.

In the second session, Miller presented recent data on his well-known experiments on the formation of amino acids from assumedly primitive gases. He reported that carbon monoxide may be substituted for methane, and ultraviolet radiation for electrical discharge. Carbon monoxide as a component of experimental mixtures of gases insures reducing conditions. Experiments of this sort have been extended in A. G. Passynsky's laboratory. Braunstein discussed ways in which some of the more complex amino acids may have arisen. Berg, a geochemist, explained how life might have begun in the earth or at the bottom of a shallow pool, either locale serving to protect the first life from destructive radiation.

In the session on the origin of proteins, nucleoproteins, and enzymes, S. Akabori discussed how a polyglycine might have arisen and been gradually supplanted by side chains. Experiments with polyglycine on kaolinite, to yield serine, threonine, and leucine or isoleucine residues, were described. Calvin's talk on chemical evolution stressed the similarities of reactions of biological and of organic chemistry. Pauling discussed duplication of molecules in organisms. R. L. M. Synge pointed out that the amino acids in the biochemistry texts are essentially the same as those described 30 years ago. Fox reported thermal experiments producing amino acids and peptides from the critical dicarboxylic amino acids and yielding the nucleic acid intermediate, ureidosuccinic acid. These reactions are linked; a benthic locale and a chemical memory mechanism were proposed. M. G. Kritzman reported on enzymic behavior in simple proteins.

In the next session, Chargaff reported that all deoxyribonucleic acid preparations examined consist of tracts of polypyrimidines and polypurines in groups of three, and that the arrangements are far from random. Fraenkel-Conrat raised the question of whether virus research should be represented at the symposium and reported on his work. In his studies of recombination of nucleic acid and protein preparations, the nucleic acid is now recognized to be totally dominant. G. Schramm emphasized the importance of polyphosphate in natural polymerization and therefore probably in prebiological chemistry. Stanley spoke on the nature of viruses, genes, and life, with special emphasis on relationships between viruses and genes as represented especially by the transduction phenomenon. He also stressed the central place of the viruses in providing a transition from molecules to organisms. Mirsky reported on his recent experiments in which small polynucleotides can substitute for nucleic acids and serve as cofactors for synthesis of adenosine triphosphate. The discussion at the end of this day concerned such problems as defining life and deciding whether viruses are alive. In summary, Oparin asked if life is merely nucleic acid and protein or these plus the rest of the cell.

In the session on origin of structure and metabolism, Oparin discussed work with coacervates. F. B. Straub expressed his view that a single precursor may serve in the production of separate enzymes—an inference which has support from other recent work. G. A. Deborin emphasized that proteins do not occur singly.

In a first session on evolution of metabolism, Braunstein and W. L. Kretovich presented reasons for believing that aspartic acid is more primitive than glutamic acid. Braunstein and M. Ishimoto each cited P. W. Wilson for evidence that ammonia is an intermediate in nitrogen fixation.

In the next session, Reid discussed the production of amino acids and the fact that irradiation of cystine yielded six or seven amino acids. D. I. Sapozhnikov discussed the evolution of phototrophy. Scher amplified Copeland's proposal, supported by his own nutritional data, that life began in thermal waters. The discussion at this, the closing session, centered on the concept of thermal origins. Bernal commented that early short-chain proteins may have been more thermostable than contemporary proteins. A concept of the recapitulation of prebiotic pathways by biotic pathways, as proposed by Fox's thermal theory, was criticized by some of the discussants, supported by others. Oparin closed the discussion on the note that the divergences of opinion expressed in the symposium cannot be settled by vote or debate—a statement which repeated what Pauling had said earlier.

The arrangements for the symposium followed the pattern of similar international conferences held in Russia within the last 2 years. Invited foreign participants were provided, upon arrival, with a sum of rubles calculated on the basis of 100 per day. Hotel bills, banquets, and railroad tickets were gratis. Various visitors spent money on records, books, telephone calls to home (48 rubles or $12 official rate, $4.80 unofficial rate, to the United States), caviar, tickets to the

ballet, the puppet show, art centers, and so on.

The scientific program was printed in both Russian and English. Translation through headphones was provided by a corps of translators who translated English into Russian, Russian into English, and German or French into Russian. The quality of some of these translations was inferior to the superb service at the United Nations sessions, for example, and was such as to hamper discussion seriously in some cases. Guides were available for official tours, and were optional for informal sightseeing.

Institutes visited in Moscow included the Bakh Institute of Biochemistry (A. I. Oparin, director), the Microbiology Institute, the Vernadsky Institute of Analytical and Geochemistry, and the Institute of Genetics (T. Lysenko, director). In Leningrad, the institutes visited included the Pavlov Institute, the very well equipped Macromolecular Institute, and the Botanical Institute. Other visits included art museums, the Lenin-Stalin mausoleum, the Kremlin, and the State University of Moscow.

Because of the interdisciplinary nature of biochemistry, it was possible to form comparative opinions about fields of science in Russia. Physics appears to be most favored, chemistry next, and biology least. Biology, in the opinion of Americans, also suffers from belated recognition of the value of modern developments in genetics. The chair of genetics at the University of Moscow was vacant, for example. Remarks based on Beadle's concepts of gene-reaction relationships were of diminished significance to Russian observers interested in the origin of life.

The visitors found that the scientists and others, even on the street, were very eager to communicate with visitors and were friendly. The hosts were extremely hospitable.

SIDNEY W. FOX
Oceanographic Institute, Florida State University, Tallahassee

Forthcoming Events

March

9–14. International College of Surgeons, 11th biennial cong., Los Angeles, Calif. (K. A. Meyer, 1516 Lake Shore Dr., Chicago 10, Ill.)

10–13. American Assoc. of Petroleum Geologists, annual, Los Angeles, Calif. (R. H. Dott, AAPG, Box 979, Tulsa 1, Okla.)

10–13. Society of Economic Paleontologists and Mineralogists, annual, Los Angeles, Calif. (R. H. Dott, Box 979, Tulsa, Okla.)

16–21. Nuclear Engineering and Science Cong., Chicago, Ill. (D. I. Cooper, *Nucleonics,* 330 W. 42 St., New York.)

17–21. National Assoc. of Corrosion Engineers, 14th annual, San Francisco, Calif. (NACE, Southern Standard Bldg., Houston 2, Tex.)

18–20. Amino Acids and Peptides, Ciba Foundation symp. (by invitation), London, England. (G. E. W. Wolstenholme, 41 Portland Pl., London, W.1.)

19. Clinical Uses of Nuclear Reactors, symp., Cambridge, Mass. (C. J. Maletskos, Medical Dept., Massachusetts Inst. of Technology, Cambridge 39.)

20–22. Michigan Acad. of Science, Arts and Letters, annual, Ann Arbor. (R. F. Haugh, Dept. of English, Univ. of Michigan, Ann Arbor.)

20–22. Pulmonary Circulation Conf., Chicago, Ill. (Wright Adams, Chicago Heart Assoc., 69 W. Washington St., Chicago 2.)

20–23. International Assoc. for Dental Research, annual, Detroit, Mich. (D. Y. Burrill, Northwestern Univ. Dental School, 311 E. Chicago Ave., Chicago 11, Ill.

23–26. American Assoc. of Dental Schools, annual, Detroit, Mich. (M. W. McCrea, 42 S. Greene St., Baltimore 1, Md.)

23–29. American Soc. of Photogrammetry, 24th annual, jointly with American Cong. on Surveying and Mapping, 18th annual, Washington, D.C. (C. E. Palmer, ASP, 1515 Massachusetts Ave., NW, Washington 5.)

24–26. Aero Medical Assoc., 29th annual, Washington, D.C. (T. H. Sutherland, Box 26, Marion, Ohio.)

24–27. Institute of Radio Engineers, natl. conv., New York. (G. W. Bailey, IRE, 1 E. 79 St., New York 21.)

26–28. American Power Conf., 20th annual, Chicago, Ill. (Illinois Inst. of Technology, 35 W. 33 St., Chicago 16.)

27–29. American Physical Soc., Chicago, Ill. (E. R. Fitzgerald, Dept. of Physics, Pennsylvania State Univ., University Park.)

27–29. Mechanisms of Hypersensitivity, 8th internatl. symp., Detroit, Mich. (W. J. Nungester, Dept. of Bacteriology, Univ. of Michigan, Ann Arbor.)

27–29. National Science Teachers Assoc., 6th natl., Denver, Colo. (R. H. Carleton, NSTA, 1201 16 St., NW, Washington 6.)

27–29. Optical Soc. of America, annual, Washington, D.C. (S. S. Ballard, Scripps Institution of Oceanography, San Diego 52, Calif.)

28. New Jersey Acad. of Science, 3rd annual, Newark. (H. L. Silverman, Nutley Public Schools, Nutley, N.J.)

29. South Carolina Acad. of Science, annual, Charleston. (Miss M. Hess, Dept. of Biology, Winthrop College, Clemson, S.C.)

29–30. American Psychosomatic Soc., 15th annual, Cincinnati, Ohio. (T. Lidz, 551 Madison Ave., New York 22.)

30–3. American College Personnel Assoc., annual, St. Louis, Mo. (L. Riggs, DePauw Univ., Greencastle, Ind.)

April

1. Microcirculatory Conf., 5th, Buffalo, N.Y. (S. R. M. Reynolds, Dept. of Anatomy, Univ. of Illinois College of Medicine, 1853 W. Polk St., Chicago 12.)

1–3. Corrosion Control, 5th annual conf., Norman, Okla. (M. L. Powers, Extension Div., Univ. of Oklahoma, Norman.)

2–4. American Assoc. of Anatomists, annual, Buffalo, N.Y. (L. B. Flexner, Dept. of Anatomy, School of Medicine, Univ. of Pennsylvania, Philadelphia 4.)

2–4. Instruments and Regulators Conf., Newark, Del. (W. E. Vannah, Control Engineering, 330 W. 42 St., New York 36.)

3–5. Pennsylvania Acad. of Science, annual, Easton, Pa. (G. R. Stevens, Dept. of Geology and Geography, Lafayette College, Easton.)

4–5. Southern Soc. for Philosophy and Psychology, annual, Nashville, Tenn. (W. B. Webb, U.S. Naval School of Aviation Medicine, Pensacola, Fla.)

7–11. American Assoc. of Cereal Chemists, annual, Cincinnati, Ohio. (J. W. Pence, Western Utilization Research Laboratories, Albany, Calif.)

8–10. Electronic Waveguides Symp., New York. (J. Fox, Microwave Research Inst., Polytechnic Inst. of Brooklyn, 55 Johnson St., Brooklyn 1, N.Y.)

9–12. National Council of Teachers of Mathematics, Cleveland, Ohio. (M. H. Ahrendt, NCTM, 1201 16 St., NW, Washington 6.)

9–14. Applied Psychology, 13th internatl. cong., Rome, Italy. (L. Meschieri, National Inst. of Psychology, Rome.)

10–11. American Inst. of Chemists, annual, Los Angeles, Calif. (L. Van Doren, AIC, 60 E. 42 St., New York 17.)

10–12. Biometric Soc., ENAR, Gatlinburg, Tenn. (T. W. Horner, General Mills, Inc., 400 Second Ave. South, Minneapolis 1, Minn.)

10–12. National Speleological Soc., annual, Gatlinburg, Tenn. (G. W. Moore, Geology Dept., Yale Univ., New Haven, Conn.)

10–12. Ohio Acad. of Science, annual, Akron, Ohio. (G. W. Burns, Dept. of Botany, Ohio Wesleyan Univ., Delaware.)

11. Vitamin B-12 Symp., New York, N.Y. (Miss J. Watson, 451 Clarkson Ave., Brooklyn 3, N.Y.)

11–12. Eastern Psychological Assoc., annual, Philadelphia, Pa. (G. Lane, Dept. of Psychology, University of Delaware, Newark.)

11–18. Horticultural Cong., 15th internatl., Nice, France. (Secretariat General, 84, rue de Grenelle, Paris 7e, France.)

12. Society for the Scientific Study of Religion, New York. (L. Whitman, 297 Fourth Ave., New York, N.Y.)

13–14. American Soc. for Artificial Internal Organs, Philadelphia, Pa. (G. Schreiner, Georgetown Univ. Hospital, Washington 7.)

13–18. American Chemical Soc., 133rd, San Francisco, Calif. (R. M. Warren, ACS, 1155 16 St., NW, Washington 6.)

13–19. Federation of American Societies for Experimental Biology, annual, Philadelphia, Pa. (M. O. Lee, FASEB, 9650 Wisconsin Ave., Bethesda 14, Md.)

14–16. Automatic Techniques Conf., Detroit, Mich. (J. E. Eiselein, RCA, Bldg. 10–7, Camden 2, N.J.)

(See issue of 24 January for comprehensive list)