



In the sparkling mountain air of Denver, where you can see Pikes Peak and a 150-mile stretch of the snowy Rockies on a clear day, members of the AAAS will assemble for the 128th annual meeting. The AAAS-wide session on Tuesday evening 26 December begins with a subject of particular interest in the mining capital born in the 1859 gold rush. Howard Meyerhoff, a geologist who now heads the Scientific Manpower Commission, will report some little-known facts behind the looming mineral shortage in the U.S. You may still meet a few jackbooted miners in the streets of Denver, and Meyerhoff will tell you why he thinks mineral exploration has not moved far enough beyond the methods of '59.

You will not want to miss Meyerhoff's account of why the mineral miners have lagged behind the oil men in developing scientific techniques of exploration and extraction. Now rapidly dropping to a metal-buyer's position in a politically fragmented world, the U.S. must use the relatively new sciences of geophysics and geochemistry to open a new frontier of mineral technology, Meyerhoff says.

At the same session, you will hear Arthur von Hippel, a physicist and pioneer in the new field of molecular science and engineering. Von Hippel, director of the Laboratory for Insulation Research at M.I.T., tells us that he will discuss "the molecular concepts which give science and engineering the basis for a true alliance."

Report from the Scientist Who Heads AEC's \$2.7 Billion Affairs

Denver is 2 hours by jet from the West Coast and 4 hours from the East, and we know of some particularly busy men who are planning to take the flight for just one session of the mammoth AAAS program. This, of course, is the address by Glenn Seaborg, the chemist and Nobel laureate who is now running one of the world's biggest businesses—the \$2.7 billion-a-year enterprises of the Atomic Energy Commission. On Wednesday evening members and guests will hear a report from the man who has been reporting to the President on the resumption of nuclear testing and who is making the decisions on the U.S. atomic arsenal and the role of government and private enterprise in the development of atomic power.

Will We Find Life in Space?

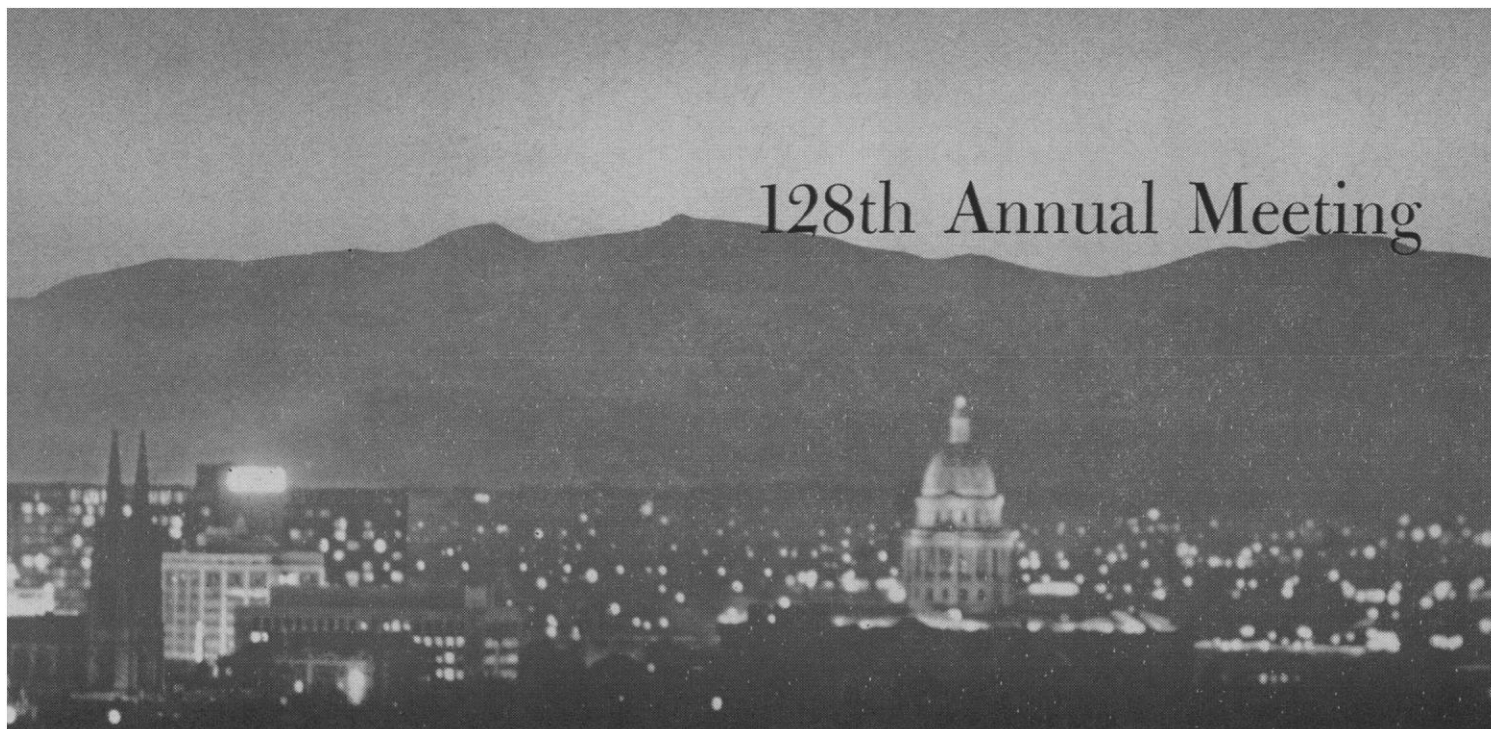
You'll be a mile nearer the moon in Denver, but your best look at what may lie beneath its siliceous dust will come at a day-long symposium sponsored by the chemistry section on Wednesday 27 December. Here 11 men representing nine scientific fields will tell you what they have so far found out in laboratory approaches to the most alluring of scientific questions: will we meet the "fancy rust" called life elsewhere in the solar system?

No, says Philip Abelson, the dis-

tinguished Carnegie Institution geochemist and member of the general advisory committee to the Atomic Energy Commission. Over the last year Abelson, who was the first man in the U.S. to identify uranium fission products, has been matching what astronomers know about the environments of the moon and planets against what biologists know about the requirements of life on earth. He will tell why his work, including studies of a green alga under laboratory conditions simulating a time span of 25 million years, adds up to this conclusion: "Life as we know it cannot exist on the Moon, Venus, Mars or other planets of the solar system, and the potential longevity of microbes in meteorites is relatively short."

Charles Phillips, the chemist who organized the symposium, thinks life is tenacious. Phillips, director of the physical defense division of the U.S. Army Chemical Corps Biological Laboratories, is one of the specialists helping to plan sterilization of the lunar probe that the U.S. expects to launch early next year. This is one point of agreement between terrestrial East and West: both Soviet moon probes were reported to be sterilized. Neither the U.S. nor the U.S.S.R. wants to risk the irretrievable scientific sin of contaminating the airless moon, whose long sweep of spatial debris may hold clues to the origin of life.

You will be particularly interested in Phillips' recent experiments indicating that certain durable forms of life



[Fred Maroon photograph reproduced by permission of *Holiday*, copyright 1961, Curtis Publishing Co.]

survive extremely high vacuums—contrary to the recent report from Hughes Aircraft researchers. With Arnold Wedum, physician and safety director of the U.S. Army Chemical Corps Biological Laboratories, Phillips will present a film showing how techniques for handling dangerous microorganisms can be adapted to space biology.

Frederick Sisler, microbiologist, and Walter Newton, parasitologist, are looking into the core of the Murray meteorite which fell in Kentucky 10 years ago. As a U.S. Geological Survey researcher, microbiologist Sisler has unlocked life from terrestrial rocks that are millions of years old. Using techniques developed for the fossil studies and working in Newton's laboratory for germ-free animal research at the National Institutes of Health, these workers found a microorganism in the meteorite samples. The organism has grown in a culture medium but not when inoculated into germ-free animals. No one has identified the growth—a strange L-like form of microbial life—but it looks like a marine species. Sisler will tell what his recent experiments show on the key question: To what degree can the probability of earth contamination be ruled out in deciding that the meteorite brought life from outer space?

Life's tracks are characteristic multi-ring carbons and long alkane chains linking odd numbers of carbon atoms, according to Warren Meinschein, a geochemist who is the Esso Research

& Engineering Co. expert on analysis of the hydrocarbons in the earth's ancient sediments. Meinschein has also been looking into meteorites—three of them, in fact—and will tell you why he thinks the patterns he found in spectroscopic analyses of the meteorite hydrocarbons are evidence of a marine life form. Bartholomew Nagy, geochemist, Fordham University, George Claus, microbiologist, New York University Medical Center, and Douglas Hennessy, chemist, Fordham University, will join in this report.

Since Huygens, astronomers on the troubled Earth have gazed hopefully at the "canals" and recurring bands of green on Mars as signs that neighbors somehow survive on the cold red planet where no fire burns. Hubertus Strughold, the U.S. Air Force's chief expert on space medicine, thinks he has met the main conditions of Martian environment in flight above 56,000 feet and duplicated these in Air Force space laboratories. He will review the Martian data and tell why he thinks there is life there—but not beyond the lichen stage.

But bacteria pathogenic to mice have survived in laboratory conditions designed to approximate the almost oxygenless Martian environment. Richard Ehrlich, bacteriologist, and Ervin Hawrylewicz, biochemist, Illinois Institute of Technology, will tell how they have demonstrated this.

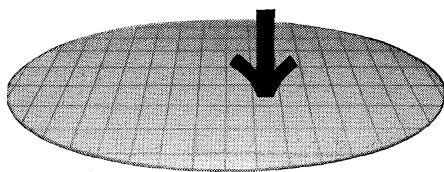
Sidney Fox, the biochemist at Florida State University who produced large polypeptides by heating 18 or so amino

acids in glutamic acid, has also offered some interesting suggestions of how primitive life may have been protected from the coagulative effect of high temperature. Fox will be on hand to offer evidence in support of a thermal theory of the origin of life and surface coagulation as the origin of the cell membrane.

The old Arrhenian theory of interstellar panspermia may finally be laid to rest at this session by Carl Sagan, the University of California physicist who not long ago dealt with the question of whether a mineralogist, petroleum geologist, or deep-sea diver should be sent to Venus (he says those clouds are ice crystals). Sagan may also have time to refer to a planetary engineering program he recently proposed to make the moon habitable.

Not many of his students at Milton Academy in Boston know that astronomer Harry Stubbs leads a double life. As Hal Clement he writes engrossing science fiction. Whether this versatile scientist will appear on the symposium as astronomer Stubbs or science fictioneer Clement is not for us to say.

For other sessions of the chemistry section and for sessions of the mathematics section, see the program summary on page 1376. A comprehensive preliminary announcement of the Denver program appeared in Science, 26 May 1961. Additional news will appear in future issues. Send in the coupon on page 1328 for the complete program.



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Benedict, I. J., 1961, WATER & SEWAGE WORKS, 108:2, pp. 74-76, Feb.

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AAAS Symposium Volume No. 52

EVOLUTION OF NERVOUS CONTROL FROM PRIMITIVE ORGANISMS TO MAN

Editor: Allan D. Bass

1959, 240 pp. \$5.75, AAAS members' prepaid orders \$5.00

From a review in the *Psychiatric Quarterly*, January 1960:

This book is another in the superb series of monographs put out by the American Association for the Advancement of Science. . . . The text is actually a very readable review of some of the major research going on in various phases of neuropsychiatry.

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Program Summary

Chemistry

Program chairman: Essie White Cohn, University of Denver. Program arranged with the assistance of the American Chemical Society, Colorado section, and the Colorado-Wyoming Academy of Science.

Wednesday 27 December

Recent Advances in Carbohydrates: Organic Chemistry Symposium. Part I: Monosaccharides, arranged by Horace S. Isbell, National Bureau of Standards. Condensation, cleavage, and rearrangement reactions, Isbell. Ketopentoses in synthesis of branch-chain sugar acids, Robert J. Ferrier. Biosynthesis of deoxyhexoses, John H. Pazur. Labeling with carbon-14 and tritium, Harriet L. Frush. Gas chromatography, Henry W. Kircher.

Part II: Polysaccharides, arranged by Roy L. Whistler, Purdue University. Properties and uses, Whistler. Digestibility, Theodore E. Friedemann. Enzyme action on, Dexter French.

Extraterrestrial Biochemistry and Biology: Concurrent symposium, see page 1375 for description.

Chemists' mixer arranged by Walter H. Dumke.

Thursday 28 December

Interdisciplinary Symposium in the Earth Sciences: Geochemical Evolution—The First 5 Billion Years, cosponsored by the sections on Geology and Geography (E), Zoological Sciences (F), and Botanical Sciences (G), by the American Geophysical Union, and by the Geological Society of America. Arranged by T. S. Lovering, U.S. Geological Survey.

Part I: Cosmic and Geological Aspects. Origin of the chemical elements, G. R. Burbidge. Origin of the atmosphere of the planets, Harold C. Urey. Role of the primitive environment in shaping the course of the origin of life, Philip H. Abelson. Geochemical evolution of continental crusts, Albert E. J. Engel.

Part II: Minor Elements in the Biosphere and in Surface Waters. Effects of some minor elements on animals and people, William H. Strain. Biochemical cycle of some minor elements

in plants, Perry R. Stout. Biochemical cycle of vanadium in plants, Helen Cannon. Implications of the minor element content of some major streams of the world, Walton Durum and Joseph Haffty. Minor elements in some major municipal water supplies in the United States, Charles Durfor. Commentary, T. S. Lovering and Essie White Cohn.

Friday 29 December

Submitted papers I: Organic and biochemistry, arranged by Essie White Cohn.

Submitted papers II: Analytical and physical chemistry, also arranged by Cohn. Walter H. Dumke will preside.

These are concurrent day-long sessions.

Mathematics and Related Programs

Thursday 28 December

Man and the Computer: Invited papers, program cosponsored by the Mathematics Section (A) and the Association for Computing Machinery, arranged by W. F. Cahill, Goddard Space Flight Center, who will preside.

Friday 29 December

Some Educational Implications of the Computer Revolution, by George E. Forsythe, director of the computation center, Stanford University. Speech cosponsored by the Mathematics Section and the Association for Computing Machinery. Wallace Givens will preside.

Teaching Machines and Mathematics Programs: Interaction of Content and Programing Specialists in Developing Self-Instructional Programs. Symposium cosponsored by the AAAS Cooperative Committee on the Teaching of Science and Mathematics and by the sections on Mathematics (A) and Psychology (I). Arranged by Joseph Hammock, Bell Telephone Laboratories, and John R. Mayor, AAAS. Participants: Lewis D. Eigen, John A. Barlow, Norman A. Crowder, Lloyd E. Homme, Jack E. Forbes, Max Beberman, R. Creighton Buck, Robert M. Gagné.

Biology and Mathematics: Symposium cosponsored by the Mathematics Section and the Society for Industrial

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and Applied Mathematics, arranged by D. L. Thomsen, Jr., International Business Machines Corp. Irwin W. Sizer will preside. Participants: Wilfred J. Dixon, Jerome Y. Lettvin, Thomsen.

Saturday 30 December

Invited papers: Program arranged by Burton W. Jones, University of Colorado, who will preside.

Recommendations on the Training of Teachers of Mathematics: Symposium cosponsored by the Mathematics Section and the Committee on the Undergraduate Program in Mathematics of the Mathematical Association of America. Arranged by Robert J. Wisner, Michigan State University.

Forthcoming Events

November

10. Nutrition Conf., 7th annual, Detroit, Mich. (J. M. Orten, Dept. of Physiological Chemistry, Wayne State Univ., 1401 Rivard St., Detroit 7)

12-17. Bahamas Conf. on Medical and Biological Problems in Space Flight, Nassau, Bahamas. (I. M. Wechsler, P.O. Box 1454, Nassau)

13-14. Exploding Wire Phenomenon, 2nd intern. conf., Boston, Mass. (W. G. Chace, Thermal Radiation Laboratory, CRZCM, Geophysics Research Directorate, Air Force Cambridge Research Laboratories, Bedford, Mass.)

13-16. Magnetism and Magnetic Materials, 7th annual intern. conf., Phoenix, Ariz. (P. B. Myers, Motorola, Inc., 5005 E. McDowell Rd., Phoenix 10)

13-17. American Public Health Assoc., 89th annual, New York, N.Y. (APHA, 1790 Broadway, New York)

13-17. Gulf and Caribbean Fisheries Inst., 14th annual, Miami Beach, Fla. (J. B. Higman, Marine Laboratory, Univ. of Miami, 1 Rickenbacker Causeway, Virginia Key, Miami 49)

13-18. European Conf. on the Control of Communicable Eye Diseases, Istanbul, Turkey. (World Health Organization, Palais des Nations, Geneva, Switzerland)

14-16. American Meteorological Soc., Tallahassee, Fla. (Executive Secretary, AMS, 45 Beacon St., Boston 8, Mass.)

14-16. Electronics Research and Engineering, 15th annual, Boston, Mass. (L. Winner, 152 W. 42 St., New York 36)

14-18. Puerto Rico Medical Assoc., Santurce. (J. A. Sanchez, P.O. Box 9111, Santurce)

15-17. Eastern Analytical Symp., New York, N.Y. (A. Rekus, EAS, Research Dept., Baltimore Gas & Electric Co., Pratt St., Baltimore, Md.)

15-18. Action for Mental Health, 11th annual, Miami Beach, Fla. (H. Milt, Natl. Assoc. for Mental Health, 10 Columbus Circle, New York 19)

15-18. Society of Naval Architects and Marine Engineers, annual, New York, N.Y. (W. N. Landers, SNAME, 74 Trinity Pl., New York 6)

16-18. American Psychiatric Assoc., Milwaukee, Wis. (J. D. McGucken, 756 N. Milwaukee St., Milwaukee 2)

16-18. Etiology of Myocardial Infarction, intern. symp. (by invitation), Detroit, Mich. (T. N. James, Section on Cardiovascular Research, Henry Ford Hospital, Detroit)

16-18. Southern Thoracic Surgical Assoc., Memphis, Tenn. (H. H. Seiler, 517 Bayshore, Blvd., Tampa 6, Fla.)

16-19. American Anthropological Assoc., Philadelphia, Pa. (S. T. Boggs, 1530 P St., NW, Washington, D.C.)

17-18. Southern Soc. for Pediatric Research, Atlanta, Ga. (W. G. Thurman, Dept. of Pediatrics, Emory Univ. School of Medicine, Atlanta)

17-31. National Soc. for Crippled Children and Adults, annual conv., Denver, Colo. (NSCCA, 2023 W. Ogden Ave., Chicago 12, Ill.)

19-22. International College of Surgeons, Western regional, San Francisco, Calif. (W. F. James, 1516 Lake Shore Drive, Chicago 10, Ill.)

22-27. Automation and Instrumentation, 5th conf., Milan, Italy. (Federezione delle Societa Scientifiche e Tecniche di Milano, via S. Tomaso 3, Milan)

22-1. Radioisotopes in Animal Biology and the Medical Sciences, conf., Mexico City, D.F. (International Atomic Energy Agency, 11 Kärntner Ring, Vienna 1, Austria)

23-25. Central Assoc. of Science and Mathematics Teachers, Chicago, Ill. (J. Kennedy, Indiana State Teachers College, Terre Haute)

24-25. American Soc. of Animal Production, Chicago, Ill. (C. E. Terrill, Animal Husbandry Research Div., U.S. Dept. of Agriculture, Beltsville, Md.)

24-25. National Council for Geographic Education, Philadelphia, Pa. (L. Kennamer, Dept. of Geography, Univ. of Texas, Austin)

25-26. American College of Chest Physicians, annual interim session, Denver, Colo. (M. Kornfeld, ACCP, 112 E. Chestnut St., Chicago 11, Ill.)

26. Medical Aspects of Sports, 3rd natl. conf., Denver, Colo. (F. V. Hein, AMA Committee on the Medical Aspects of Sports, 535 N. Dearborn St., Chicago 10, Ill.)

26-1. American Soc. of Mechanical Engineers, winter, New York, N.Y. (L. S. Dennegar, ASME, 29 W. 39 St., New York, N.Y.)

26-1. Radiological Soc. of North America, annual, Chicago, Ill. (R. P. Barden, 713 E. Genesee St., Syracuse 2, N.Y.)

27-28. Agricultural Meteorology, 4th conf., St. Louis, Mo. (K. C. Spengler, American Meteorological Soc., 45 Beacon St., Boston 8, Mass.)

27-29. American Soc. of Hematology, annual, Los Angeles, Calif. (J. W. Rebeck, ASH, Henry Ford Hospital, Detroit 2, Mich.)

27-30. American Medical Assoc., Denver, Colo. (F. J. L. Blasingame, 535 N. Dearborn, Chicago 10, Ill.)