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SECOND ANNUAL BRIEFING
ON
NEW HORIZONS IN SCIENCE

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Chicago, Illinois

Monday, November 16th
through
Friday, November 20th
1964

MONDAY, NOVEMBER 16, 1964

Morning

Welcome

Dr. H. Stanley Bennett, Dean
Division of Biological Sciences
University of Chicago

MATHEMATICS AND THE MODERN SCIENCES

Professor Anatol Rapoport
University of Michigan

Afternoon

GENETICS: A BACKWARD AND
FORWARD LOOK

Professor Kimball C. Atwood
University of Illinois

TRANSCRIPTION UP TO DATE

Professor Sol Spiegelman
University of Illinois

TUESDAY, NOVEMBER 17, 1964

Morning

THE COMPUTER AND MAN-MACHINE
RELATIONSHIPS

Dr. E. E. David
Director of Computer Research
Bell Telephone Laboratories

THE BRAIN AND BEHAVIOR

Professor Eckhard H. Hess
Chairman, Psychology Department
University of Chicago

Afternoon

INFORMATION PROCESSING IN LIVING
ORGANISMS AND MIND—LIFE ARTEFACTS

Professor Heinz Von Foerster
University of Illinois

PHYSIOLOGICAL BASIS OF PERCEPTION IN
MENTAL ACTIVITY

Dr. Jerome Y. Lettvin
Massachusetts Institute of Technology

Evening

Reception: 6 P. M.

Dinner: 7 P. M. (Host: World Book Encyclopedia)

FRONTIERS IN ASTRONAUTICS

Introduction—Dr. Andrew A. Fejer, Chairman,
Department of Mechanical and Aerospace
Engineering, Illinois Institute of Technology

Captain Donn F. Eisele
Manned Spacecraft Center, Houston

WEDNESDAY, NOVEMBER 18, 1964

Morning

CHANGING PERSPECTIVES ON HUMAN
EVOLUTION

Professor F. Clark Howell
University of Chicago
(On leave from University of Chicago)

ANTHROPOLOGY AND THE FUTURE OF MAN

Professor Raoul Naroll
Northwestern University

Luncheon Debate

THE NATION'S COMMITMENT TO SCIENCE

Dr. Moody E. Prior,
Dean of the Graduate School
Northwestern University

and

Dr. John A. D. Cooper
Dean of Sciences
Northwestern University

Afternoon

FREE TIME

THURSDAY, NOVEMBER 19, 1964

Morning

GALAXIES AS RADIO SOURCES

Professor William W. Morgan
Chairman, Astronomy Department
University of Chicago

EMERGING CONCEPTS ON THE NATURE AND
STRUCTURE OF THE UNIVERSE

Professor Joseph A. Hynek
Chairman, Astronomy Department
Northwestern University

Afternoon

LOOKING AHEAD IN EARTH SCIENCE

Professor Preston E. Cloud, Jr.
University of Minnesota

CLOUD PHYSICS AND RAIN-MAKING

Professor Horace R. Byers
University of Chicago

FRIDAY, NOVEMBER 20, 1964

Morning

PHYSICS IN THE MICROCOSM

Dr. Robert G. Sachs
Argonne National Laboratory
and
Enrico Fermi Institute for Nuclear Studies
University of Chicago

PHYSICS IN THE MACROCOSM

Dr. John A. Simpson
University of Chicago

Afternoon

(At Argonne National Laboratory)

HIGH ENERGY ACCELERATORS

Dr. John H. Martin
Argonne National Laboratory

TOUR OF ARGONNE NATIONAL LABORATORY

SHORT BIOGRAPHIES OF SPEAKERS

KIMBALL C. ATWOOD came to the University of Illinois in 1960 as professor and head of the Department of Microbiology in the College of Liberal Arts and Sciences. He was born in New York City in 1921, took his A.B. degree in 1942 from Columbia University, and his M.D. degree in 1946 from the New York University College of Medicine. From 1947 to 1951, Dr. Atwood taught at Columbia University, and from 1951 to 1958 he was engaged in research at Oak Ridge National Laboratory. He then served on the faculty of the University of Chicago until he assumed his present position. The author of some thirty papers in genetics, both microbial and human, he is now engaged in a research project supported by The National Science Foundation and the Atomic Energy Commission.

H. STANLEY BENNETT, a distinguished research scientist and administrator, is dean of the Division of the Biological Sciences of The University of Chicago. Dean Bennett was born in Tottori, Japan, December 22, 1910. He received his bachelor of arts degree from Oberlin College in 1932; his degree as a medical doctor from Harvard University in 1936. He served his year of medical internship at The Johns Hopkins Hospital, and then returned to Harvard to teach, attaining the rank of associate in anatomy and instructor in pharmacology by 1942. Dr. Bennett came to The University of Chicago in 1961, from the University of Washington in Seattle, where he had been Professor and Chairman of the Department of Anatomy since 1948. He has been active in many scientific bodies and government advisory groups. On the national level, he is currently a member of the Life Sciences Panel of the President's Science Advisory Committee, and a fellow of the American Academy of Arts and Sciences, and the Illinois State Academy of Science. He is the author of more than 60 contributions to scientific and professional journals, textbooks, and encyclopedias.

HORACE R. BYERS is director of the Cloud Physics Laboratory of the University of Chicago and professor of geophysical sciences. He was born in Seattle in 1906, took his A.B. at the University of California in 1929, his M.S. at M.I.T. in 1932, and his doctorate there in meteorology in 1935. After working as a meteorologist for an airline and for the U.S. Weather Bureau, he came to the Univer-

sity of Chicago in 1940. He helped found the Department of Meteorology and served as its chairman from 1948 to 1960. He was president of the American Meteorological Society in 1952-54 and president of the International Association of Meteorology and Atmospheric Physics in 1960-63. His special interests are thunderstorms, physical and dynamic meteorology, and cloud physics.

PRESTON E. CLOUD, JR. became professor of geology and physics at the University of Minnesota in 1961. He was born in West Upton, Massachusetts in 1912, took his B.S. at George Washington University in 1938, and his Ph.D. at Yale in 1940. A geologist with the U.S. Geological Survey from 1942 to 1959, he served as chief of the Paleontological and Stratigraphic Branch for ten years. He was also an assistant professor and curator of invertebrate paleontology at Harvard from 1946 to 1948. A member of many national and international organizations in his field, he has traveled widely throughout the world and has received several honors, including the Distinguished Service Award of the U. S. Department of the Interior.

JOHN A. D. COOPER has been dean of sciences at Northwestern University since 1963. A native of El Paso, Texas, he took his B.S. at the University of New Mexico in 1939 and his Ph.D. in biochemistry at Northwestern in 1943. A member of the faculty of the Northwestern University School of Medicine since 1943, he earned his M.D. there in 1951. Dr. Cooper was the director of the Northwestern program that allows students to take the M.D. within six years of graduation from high school. He has lectured at the University of Brazil, which awarded him an honorary doctorate, and at the University of Buenos Aires. One of his major interests is the use of radioactive isotopes in medicine.

E. E. DAVID, a member of the staff of the Bell Telephone Laboratories in New Jersey since 1950, is now director of computer research there. He was born in North Carolina in 1925, took his Bachelor of Electrical Engineering degree at Georgia Institute of Technology and his Master's and Doctor's degrees at M.I.T. in 1950. For several years he was director of visual and acoustical research at Bell Labs. He has received several awards for his research. Special interests include microwave techniques, acoustics, communication theory, human communication, and psychophysics.

CAPTAIN DONN F. EISELE was born in Columbus, Ohio, June 23, 1930. He attended the United States Naval Academy and received a bachelor of science degree in 1952, and chose an Air Force career. In 1960, he received a master of science degree in astronautics from the Air Force Institute of Technology at Wright-Patterson AFB, Ohio. His last Air Force assignment before being named an astronaut was as flight commander and experimental test pilot at the Air Force Special Weapons Center at Kirtland AFB. In this capacity he flew experimental and developmental test flights in jet aircraft in support of special weapons development programs. He has amassed more than 2,500 hours flying time, with more than 2,100 hours in jet aircraft. Captain Eisele is a member of Tau Beta Pi, national engineering society.

ECKHARD H. HESS is chairman of the Department of Psychology at the University of Chicago. He was born in Bochum, Germany, in 1916, and is a citizen of the U. S. After taking his bachelor's degree at Blue Ridge College in 1941, his M.A. at The Johns Hopkins University in 1947, and his Ph.D. also at Hopkins in 1948, he joined the faculty of the University of Chicago. He has specialized in visual perception in animals and humans and is especially well known for his studies of "imprinting," the early social experiences that determine adult behavior.

F. CLARK HOWELL, professor of anthropology at the University of Chicago, has specialized in the study of human evolution and of early man. He did his undergraduate work at the University of Chicago and took the Ph.D. there in 1953. After two years as an instructor in anatomy in the School of Medicine at Washington University in St. Louis, he joined the faculty of the University of Chicago in 1955.

JOSEPH A. HYNEK became chairman of the Department of Astronomy at Northwestern University in 1960. He was born in Chicago in 1910, took his B.S. at the University of Chicago in 1931, and his Ph.D. there in astrophysics in 1935. From 1935 to 1956 he was a member of the faculty of Ohio State University. Then, until 1960, he was associate director of the Smithsonian Institution's Astrophysical Observatory and was in charge of the worldwide network of 12 satellite-tracking stations. During this period he was also a lecturer at Harvard University. Dr. Hynek is an authority on

unidentified flying objects. His research interests include double stars, stellar spectroscopy, and computer cataloguing of space data.

JEROME Y. LETTVIN, a research associate in the Department of Electrical Engineering at the Massachusetts Institute of Technology, has done extensive research in the nervous events underlying perception. He was born in Chicago in 1920, received a B.S. in 1942 and an M.D. in 1943 from the University of Illinois. From 1944 to 1946 he served in the U.S. Army as head of neuropsychiatry at the 237th General Hospital in the European Theatre. Following his discharge from the Army he was a neurologist at the Veterans Administration Hospital in Boston (1946-1947), a researcher on a motion sickness project at the University of Rochester (1947-48), and senior psychiatrist at the Manteno State Hospital in Illinois (1948-51). Dr. Lettvin came to M.I.T. Research Laboratory of Electronics in 1951 and from 1959 to 1964 he was associate professor of biology there. He is now a research associate at RLE. In collaboration with others at M.I.T. Dr. Lettvin has conducted numerous studies in the operations of specific fibers in the optic and olfactory nerves of the frog.

JOHN H. MARTIN, an associate physicist at Argonne National Laboratory, was instrumental in designing and constructing the multimillion dollar Zero Gradient Synchrotron dedicated last December at Argonne. While taking his undergraduate degrees at Indiana University, Dr. Martin helped build Indiana's first major atom-smashing machine, a cyclotron. He acquired his Ph.D. degree at Washington University in St. Louis. During the first half of World War II he was civilian in charge of the installation and maintenance of ground radar from Maine to South Carolina. In the last half of the war he directed a testing range for underwater acoustical devices used in submarine warfare, and was also on the staff of the University of California, near San Diego.

WILLIAM W. MORGAN is chairman of the Department of Astronomy at the University of Chicago and the director of the Yerkes and MacDonald observatories. He was born in Tennessee in 1906, took his B.S. at the University of Chicago in 1927 and his Ph.D. at Chicago in 1931. He has been on the staff of the Yerkes Observatory and the faculty of the University of Chicago since 1926. An author-

ity on the structure of our galaxy and on extragalactic systems, he has been awarded the Bruce Gold Medal of the Astronomical Society of the Pacific.

RAOUL NAROLL, acting chairman of the Department of Anthropology at Northwestern University, teaches courses in the problems of intersocial comparisons, culture and personality, social bases of mental health, and the dynamics of culture. Born in Toronto, Canada, in 1920 and a naturalized citizen of the U.S., he took his Ph.D. at the University of California in Los Angeles in 1953. He then spent a year as a fellow at the Center for Advanced Study in the behavioral sciences at Stanford University. He has also been a member of the faculty at San Fernando Valley State College. His research projects have included studies of cultural stress in general, and suicide in particular, social development, and the relation of warfare to territorial growth.

MOODY E. PRIOR occupies the John C. Shaffer chair in humanities and English at Northwestern University. A native of Turkey, he became a U. S. citizen in 1914 and took his Ph.D. from the University of Chicago. He was dean of the Graduate School of Northwestern from 1951 to 1964. He is especially interested in the thought and literature of the sixteenth and seventeenth century in England. Dr. Prior wrote the books, *The Language of Tragedy*, 1941, and *Science and Humanities*, 1962. He is a former president of the Association of Graduate Schools.

ANATOL RAPOPORT, professor of psychology and senior research mathematician at the University of Michigan's Mental Health Research Institute, has been on the faculty at Michigan since 1955. He was born in Russia in 1911 and moved to the United States in 1922. After attending the public schools in Chicago, he obtained degrees in music in Chicago and at the State Academy of Music in Vienna, Austria. This was followed by four years on the concert platform in Europe and America. He earned his B.S. degree in 1937, an M.S. in 1938, and the Ph.D. in mathematics in 1941, all at the University of Chicago. From 1942 to 1946 he served with the Air Force in Alaska and India. He then spent seven years as a research associate and assistant professor of mathematical biology at the University of Chicago, and a year as a fellow at the Center for Advanced Study in the Behavioral Sciences. His main contributions have been

in the areas of the philosophy of science, theories and techniques of conflict resolution (particularly on the international and ideological level), semantics and the influence of language habits on behavior and information theory and game theory. He has published over a hundred articles in magazines and professional journals. His books include *Science and the Goals of Man*; *Operational Philosophy*; *Fights, Games, and Debates*; and *Strategy and Conscience*.

ROBERT G. SACHS, a theoretical physicist, became associate director for high energy physics at Argonne National Laboratory in February, 1964. He is also a member of the staff of the Enrico Fermi Institute for Nuclear Studies at the University of Chicago. A native of Hagerstown, Maryland, he took his Ph.D. in physics at The Johns Hopkins University in 1939. After serving on the faculties of George Washington University, the University of California, and Purdue University, he became chief of a section at the Ballistic Research Laboratory, Aberdeen Proving Ground, in 1943. In 1946 and 1947 he was director of the Theoretical Physics Division of the Argonne National Laboratory. He then went to the University of Wisconsin as a full professor of physics, a position he held until joining the staff at Argonne this year. Among his honors are an appointment in 1955-56 as Higgins visiting professor of physics at Princeton University, and a Guggenheim fellowship and visiting professorship at L'École Normal Supérieure in Paris, France, 1959-60. His book *Nuclear Theory* is considered one of the standard works in the field. His special interests include high-energy physics, fundamental particles, nuclear theory, solid state, terminal ballistics, and nuclear-powered reactors.

JOHN A. SIMPSON, professor in the department of physics and the Enrico Fermi Institute for Nuclear Studies at the University of Chicago, is one of the world's leading authorities on cosmic rays, the nuclear fragments from outer space that bombard the earth's atmosphere. He was born in Portland, Oregon, on November 3, 1916, received his A.B. from Reed College (Portland) in 1940, and both his M.S. (1942) and Ph.D. (1943, physics) from New York University. During 1941-43 he was a research associate with NYU's war-time project for the U.S. Office of Scientific Research and Development. For the remainder of World War II (1943-46) he was a scientific group leader of the University of Chicago's atomic bomb project, the Metallurgical Laboratory. He was appointed instructor

in the University of Chicago, 1946; assistant professor, 1947; associate professor, 1949; and full professor in 1954. As director of the Cosmic Radiation Research Group, one of two laboratories at the University completely devoted to studies of cosmic rays, Dr. Simpson directs a network of monitoring stations from Climax, Colorado, to Huancayo, Peru, and has worked closely with the Geophysics Directorate of the United States Air Force since 1948. Dr. Simpson is a fellow in the American Physical Society, a member of the National Academy of Sciences, and a member of Phi Beta Kappa and Sigma Xi. He has been a consultant to Argonne National Laboratory since 1946.

SOL SPIEGELMAN, professor of microbiology at the University of Illinois, was born in New York City in 1914. He took his B.S. in mathematics and physics from the College of the City of New York in 1938 and his Ph.D. in cellular physiology from Washington University in 1944. He joined the Washington University faculty in 1942 as lecturer in physics and also served there as lecturer in applied mathematics, and instructor and assistant professor in bacteriology in the School of Medicine. In 1948 and 1949 he performed research as a special fellow of the U. S. Public Health Service at the University of Minnesota's Medical School, going from there to his present post at the University of Illinois. He studies adaptive enzymes, genetics and biochemistry of micro-organisms; mechanism of gene actions; embryology; cellular physiology; and protein and nucleic acid synthesis.

HEINZ VON FOERSTER is founder and director of the Biological Computer Laboratory at the University of Illinois and is also professor of both electrical engineering and biophysics. Born in Vienna, Austria, in 1911, he took the physics engineering diploma at the Institute of Technology in Vienna and the Ph.D. in physics from the University of Breslau, Germany, in 1944. He held high positions in several research laboratories in Germany and Austria, and worked with the radio network of the Information Service Branch of the U.S. Army in Vienna before coming to the U.S. in 1949. His association with the University of Illinois began at that time. Last year he became president of the Wenner-Gren Foundation for Anthropological Research. He serves as a consultant to numerous governmental agencies.

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