uncommon stresses and torques. Power supplies must be investigated, because smooth delivery of power will be a necessity. It has been proposed that the power may have to be delivered at the bottom of the ocean rather than from a barge at the surface in order to eliminate the 15,000 to 18,000 feet of drill stem needed to get through the water.

In addition, several kinds of fixed platforms have been proposed, some anchored and some on legs. Most of these appear to be impractical because of the depth of the sea where the drilling is to be done and because of the great cost.

A "Drilling Methods" panel is being organized by the AMSOC Committee to either devise new drilling techniques or determine which of the known techniques can be used.

Choosing the Drilling Site

Choosing the drilling site will be one of the most difficult problems. A panel has been appointed to select the site. Without doubt this will be somewhere in the ocean.

One possible spot for drilling in the Atlantic lies 200 miles north of Puerto Rico on the rise just north of the Puerto Rican Trench. This is a region of hurricanes and of troublesome and little understood oceanic currents. This means, of course, that the weather might be an obstacle in this area.

In the Pacific the depth to the mantle under the Albatross Plateau is not great. This plateau is about 2000 miles southwest of San Diego. Logistic problems alone will probably eliminate this area as a drilling site, since it is necessary that a good supply port be reasonably close at hand. Also, large oceanic swells occur throughout the area. The huge southwest Pacific swells can be as alarming as storm waves.

All promising areas must be investigated with respect to the following factors: (i) The mantle must be within reach; (ii) an adequate sedimentary section must be obtainable; (iii) a good port must be reasonably close at hand; (iv) ocean currents, swell, and depth of water must be suitable; and (v) prevailing weather conditions must be favorable.

An averaging and weighting of the findings on these points will give us our location. A tremendous amount of work must be done. It is readily apparent that it will not be easy to select the site.

Financing

Drilling to the Mohorovicic Discontinuity falls in the category of "big projects." Experience shows that the so-called "big projects," such as moon rocketry, atom bombs, and national observatories, tend to bring money into an entire field of science rather than decrease the amount of funds available for small projects in that field. It is not a question of big projects versus little projects. Each must justify itself.

The Mohorovicic Discontinuity project probably can be accomplished for $5 million. Earlier and larger estimates were out of bounds. Five million dollars is a lot of money, but compared to the many millions of dollars that are being spent on moon rocketry and the billions being spent on atom bombs, this is not an overly ambitious scientific endeavor.

The American Miscellaneous Society, with its flair for seeing the lighter side of heavier problems, likes to quote the following proverbs when discussing the "Moho": (i) "When going ahead in space, it is also important to go back in time"; (ii) "The ocean's bottom is at least as important to us as the moon's behind!" These proverbs derive from modern scientific folklore. The point is, let us first thoroughly examine the earth before we abandon study of it in favor of extraterrestrial problems. In any case, we may consider the earth to be a prototype planet, and from detailed study of the earth we cannot fail to gain information which will be useful to us in studying other planets and the remainder of the universe.

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Karl Spencer Lashley, Experimental Psychologist

Karl Spencer Lashley was born in Davis, West Virginia, on 7 June 1890 and died suddenly in Poitiers, France, on 7 August 1958. He was one of the world's greatest experimental students of brain function in relation to mammalian behavior. He established a quantitative association between neocortical mass and habit formation and made other basic contributions to physiological psychology and neurology.

Lashley was a graduate of the University of West Virginia and held the degree of master of science in bacteriology from the University of Pittsburgh and the degree of doctor of philosophy in genetics from the Johns Hopkins University. His first paper, published in 1912, was on visual discrimination of size and form in the albino rat. He also wrote two papers, with H. S. Jennings, on biparental inheritance in paramecia. In the next few years Lashley published a series of papers jointly with the late J. B. Watson, the behavioristic psychologist, dealing with the adaptive life of a number of animal forms. One of these was a study of homing in birds. Another was an often quoted paper on the nesting activities of noddy and sooty terns. In the next two years there were papers on learning in human beings and in animals, and in 1917, two papers published jointly with Shepherd Ivory Franz on the retention of habits by the rat after removal of localized portions of the cerebrum.

From this time on, most of Lashley's major research centered on his truly epoch-making study of cerebral functions in relation to habit formation, perception, and other psychological processes. During the 1920's and 1930's he published a notable series of papers dealing with cerebral functions in relation to continued practice and other aspects of learning. These studies included investigations on the functions of the motor areas, vicarious function after destruction of specific areas, the equipotentiality of certain brain areas, the relationship between cerebral mass and habit retention, and many related problems. A later series of papers dealt with the mechanisms of vision in the white rat and other mammals.

Much of Lashley's early work on the learning process is summarized in his book, *Brain Mechanisms and Intelligence*. In a later paper, "Reflexology vs. Cerebral Control," he pointed out that his research led him more and more to the view that mammalian behavior is controlled by engrams within the central nervous system itself, rather than by changes in patterns of physically measured peripheral stimulation or even by the differential activity that inputs from receptors set up in the sensory projection areas of the brain.

In 1934 Lashley contributed a notable chapter to the *Handbook of General Experimental Psychology,* edited by Carl Murchison. In this presentation, which is really a long theoretical paper, he discussed the origin of mammalian behavior patterns during growth, the development of learning capacity in the evolutionary series, and especially the old and complex problem of the structural neural changes that must be basic to habit formation. In this latter consideration Lashley gave special attention to what he liked to call the localization of the engram. Here he explained, largely on the basis of his own comprehensive experimental work, the difficulties that are inherent in the older theories of the physiological basis of habit formation. He pointed out unsolved problems in theories in which learning is assumed to depend on the growth of new processes in connecting neurons; the increase in conducting substances

Karl Spencer Lashley

as the result of exercise; mechanical changes in the region of contact between cells; and the persistence of excitatory processes. He also criticized theories which attempted to explain cortical activity by analogy with drainage or irradiation.

Even at the end of his long and fruitful experimental career, Lashley liked to point out that the great problem of the physiological basis of learning, memory, and habit formation had not been fully solved. He was most conservative in the matter of attributing importance, other than as an analogy, to the idea that the brain functions in learning in a way that is similar to the operation of modern computing machines. There is no question, however, that his own studies led him to hold a dynamic theory of the activity of the brain in habit formation. He refuted notions of so-called specific memory cells and unchanging minute areas as a locus of habits.

One of Lashley's last contributions to psychology was a scholarly introduction to a book, *Instinctive Behavior,* translated and edited by his wife (Claire H. Schiller). In his introduction to the book he gave special notice of his interest in the new science of ethology as developed by Konrad Lorenz and Nicholas Tinbergen and their associates. In this introduction Lashley, commenting on Paul Schiller's investigation of stick-joining and other insightful behavior in chimpanzees says, "The insight is the immediate, one-trial learning to use the innate manipulative acts in the manner discovered by chance, and the generalization of the acts to other, similar situations . . . an extension of the same concepts to the manipulation of ideas may well lead to the conclusion that man has failed to identify his own instincts because he calls them intelligence."

Lashley began his academic career as a student and colleague of the distinguished group of behavioral scientists who were at the Johns Hopkins University just before World War I. From 1917 to 1926 he was a member of the faculty of the University of Minnesota. From 1927 to 1929 he was research psychologist for the Behavior Research Fund in Chicago. From 1929 until 1935 he was professor of psychology at the University of Chicago. From 1935 to 1937 he was professor of psychology at Harvard University and from 1937 to 1955, research professor of neuropsychology at Harvard. From 1942 until 1955, while still holding his Harvard professorship, he was in residence at Orange Park, Florida, as director of the Yerkes Laboratories of Primate Biology. From 1955 until his death he was research professor emeritus at Harvard. During the period of his directorship of the Yerkes Laboratories, he not only conducted much important primate research himself but stimulated colleagues and graduate students to undertake a significant series of studies. During his scientific career he published more than one hundred major articles and monographs.

He was active in many scientific and professional organizations. In 1935 he became a member of the American Philosophical Society, the academy founded by Benjamin Franklin in Philadelphia in 1743. His interest in this society is demonstrated by the fact that just a year before he died he gave the society a substantial sum of money to establish an endowment to provide for an annual award for distinguished work in neurobiology. Only as a result of most urgent request on the part of officers of the society did Lashley permit this fund and the award that it established to be named for him. He became a member of the National Academy of Sciences in 1930. He was also a member of the American Academy of Arts and Sciences and president of the American Psychological Association in 1929. In 1937 he served as president of the Eastern Psychological Association. He was a member of the Society of Experimental Psychologists, the American Society of Zoologists, the American Physiological Society, the Society of American Naturalists (of which he was president in 1947), and the Society of Human Genetics. He was honorary member of the

Harvey Society, the American Neurological Association, and the British Association for the Study of Animal Behavior and a foreign member of the British Psychological Association and the Royal Society of London. On 28 July 1958, only a few days before his death, he formally signed in London the historic membership book of the Royal Society.

Lashley gave the Hughlings-Jackson Memorial Lectures in Montreal in 1937, the Vanuxem Lectures in Princeton in 1952, and special lectures at Columbia and other American universities and at the universities of London, Berlin, and Moscow. He was the recipient of the Howard Crosby Warren medal of the Society of Experimental Psychologists, the Daniel Giraud Elliot medal of the National Academy of Sciences, and the Baly medal of the Royal College of Physicians.

Lashley's two great hobbies were sailing and music, and he was creative in both of them. He designed and built several admirable small sailboats that had a number of unique features which he had invented. He also loved to play the violoncello and participated, as volunteer member, in the Jacksonville Philharmonic Orchestra and in a number of chamber music groups.

As a small boy he had participated with his parents in the Klondike Gold Rush of 1898. He never forgot these exciting experiences, and twice after his retirement in 1955 he went to Alaska to retrace this early trip.

To many people this distinguished scientist seemed shy and reserved, but his close friends knew him as warm-hearted, wise, and gay. In his death the world has lost a brilliant student of neurology and behavior. His studies advanced in a significant way our understanding of the physiological basis of the mental life of man.

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News of Science

World Meteorological Congress Studies Use of Satellites

On 28 April the World Meteorological Organization's third congress completed a 4-week session in Geneva, after calling for a continuing review of the use of artificial satellites to obtain weather information, new studies on atomic energy questions, and action to fill gaps in the world network of weather observation stations. The congress, which meets once every 4 years, also planned its technical program and budget for the period 1960 through 1963, reelected Andre Viaut (France) as president, and reappointed David A. Davies (United Kingdom) as secretary-general of the organization. In the course of the session, WMO membership rose to 102 states and territories. Action was taken at the congress in the following fields.

Outer Atmosphere and Satellites

In view of the bearing of satellite observations on meteorology, the executive committee of WMO had designated a rapporteur, Harry Wexler of the United States Weather Bureau in Washington, to prepare a report on this problem, paying particular attention to activities that might be undertaken by WMO. This report was issued during the session, and the congress examined it in detail.

The congress considered that it was difficult to foresee the developments which might take place in the course of the next few years in this field. Therefore the congress adopted a resolution in which it commented that the results of meteorological measurements which may be made by means of satellites are of great potential value, not only for meteorological research but also for direct use in forecasting.

The congress instructed the WMO executive committee to arrange for a continuing review to be made of the uses of artificial satellites for meteorological purposes and to keep members informed of developments.

Meteorology and Atomic Energy

After a discussion that included a statement by a representative of the International Atomic Energy Agency, the congress adopted a resolution expressing its view that the organization can play a useful role in the use of radioisotopes in meteorological measurements, the safety of atomic plants, and measurement of radioactivity in air and water. The resolution also directs the executive committee to implement a large program of study and publication in connection with these three aspects. It calls for continued consultations with IAEA and other international organizations in this field and for continued cooperation with the United Nations Scientific Committee on the Effects of Atomic Radiation.

World Network of Meteorological Stations

The congress reaffirmed as one of the WMO's essential aims the maintenance and improvement of the world network of weather observation stations. It was stressed that many important meteorological problems such as the study of the general circulation of the atmosphere could not be fully understood until the existing serious gaps in the network had been filled. Therefore, the congress directed the executive committee to make use of all possible means—such as international or multilateral agreements for joint support and financing, technical assistance, and the United Nations Special Fund—to achieve improvement of the world network of meteorological stations.

The congress also directed the executive committee to give effect within the next 4 years to joint-support projects which may help improve the international exchange of weather information and to meet deficiencies in the network of observation stations. (Joint-support schemes are based upon international or multilateral agreements between countries interested in a particular project and involve the financing of the project by the countries which are contracting parties to the agreement.) In addition, standardization of the instruments internationally used in meteorology was considered to be an activity which would be in need of collective aid.

Program and Budget

The congress adopted for the 4-year period 1960–63 a budget of $2,694,484. The budget for the last 4 years (1956–59) amounted to $1,770,000.

The technical program of the organi-