out introducing the idea of force, by assuming that the chain arranges itself in such a way as to make its center of gravity have the lowest possible position. This assumption, that the height of the center of gravity is a minimum, is a typical minimum-principle. At least one minimum-principle was known to the ancient Greeks, namely, that when a ray of light issuing from a source is reflected at a mirror and afterwards received by an observer, then the path followed by the incident and reflected rays is shorter than any other path from the source to the observer which meets the mirror.

By a succession of discoveries it was shown that all the happenings of nature can be predicted by means of minimum-principles: the climax was reached in 1915, when Hilbert showed that all physical events (gravitational, electrical, etc.) in the universe are determined by a "world-function" which is such that its integral taken over the whole of space-time is a minimum. Such a statement as this has a decidedly Aristotelian character; for, in studying change, Aristotle always fixed his attention on the end to be fulfilled: his science was essentially teleological. Again we see how classical physics, following its own natural development, tended to deviate from the pattern devised by Newton and to return to the Aristotelian-Scholastic mould.

A change in orientation such as this, however, did not affect the fundamental assumptions of Newtonian science. We have now to consider developments of a far more subversive nature.

The first serious trouble arose in connection with the doctrine of space. The space of Gassendi and Newton was, so far as geometry was concerned, the space of Euclid: it was infinite, homogeneous and completely featureless, one point being just like another; so far as physics was concerned, it was like the vacuum of the ancient atomists, mere emptiness into which things could be put. From the philosophical point of view this concept was open to the objection that Aristotle had urged against the doctrine of the atomists, namely, that if space were devoid of local properties, the tendency of a body to move spontaneously in a particular direction (*e.g.*, the existence of a gravitational field, as we should say) would be unintelligible. As a matter of fact, the successors of Newton felt this difficulty; and, having started with a space which was in itself simply nonentity, having no property except a capacity for being occupied, they proceeded to fill it several times over with ethers designed to provide electric, magnetic and gravitational forces, and to account for the propagation of light; and as it was impossible to draw any effective distinction between those ethers and space, Newtonian space became eventually a plenum of the most elaborate kind, possessing such qualities as density and rigidity everywhere. Its points were capable of individual identification, and could be regarded as fixed; and having thus acquired a more definite and concrete substantiality than Newton himself had ever contemplated, its absolute character became an essential and inseparable axiom of classical physics. But the discovery in 1905 of the principle of relativity led to inferences incompatible with the existence of any kind of quasi-material ether: and thus the Gassendi-Newton doctrine became involved in hopeless contradiction.

(To be concluded)

OBITUARY

ALEŠ HRDLIČKA

March 29, 1869–September 5, 1943

ALEŠ HRDLIČKA was born of worthy middle-class parents at Humpolec, Bohemia. In 1882 the family moved to New York. There, in 1892, he got a degree at the Eclectic Medical College of the City of New York and in 1894 from the New York Homeopathic Medical College. Soon after he joined the staff of the State Homeopathic Hospital for the Insane at Middletown, N. Y., and also became affiliated with the Pathological Institute of the N. Y. State Hospitals. His early years with the mentally and physically abnormal convinced him of the need for knowing the normal, and this became the guiding principle of his entire scientific life.

Dr. Hrdlička was truly a prodigious worker, both in the laboratory and in the field. In 1898 he took his first field trip, with Lumholtz to Mexico, where he studied the Tarahumares, the Huichols and the Tepehuanes. These trips were continued in 1899–1902, to the southwestern United States and northern Mexico, under the auspices of the Hyde expeditions of the American Museum. He had an unusual ability to "get along" with natives, and these field trips were very fruitful. They were the first of many that took him all over the world: to Egypt and the Near East in 1909, to Siberia and Mongolia in 1912, to Peru in 1913, to the Far East in 1920, to Africa, Asia and Oceania in 1925, to Alaska and the Aleutians in 1926–38, to Russia and Siberia in 1939, besides numerous trips to Europe and expeditions within the United States.

In 1903 Dr. Hrdlička became assistant curator and in 1910 curator of the Division of Physical Anthro-

pology of the U. S. National Museum, a position which he held until his retirement in 1941. In this capacity he published countless articles and many books. Among the latter are: "Skeletal Remains Suggesting or Attributed to Early Man in North America" (1907, 1918); "Physiological and Medical Observations among the Indians of Southwestern United States and Northern Mexico" (1908); "Early Man in South America" (1912); "The Most Ancient Skeletal Remains of Man" (1914, 1930); "Anthropometry" (1920); "The Old Americans" (1925); "Anthropological Survey of Alaska" (1930); "Children Who Run on All Fours" (1931); "Practical Anthropometry" (1939); "Alaska Diary" (1943); "Catalogues of Human Crania in the U. S. National Museum" (1924, 1925, 1927, 1928, 1931, 1942).

In 1896 Dr. Hrdlička married Marie Dieudonnec, of New York City. Her death in 1918 was greatly mourned. In her honor there was established the "Aleš and Marie Hrdlička Foundation" in Czechoslovakia, which subsidized, in part at least, a chair of anthropology at the Charles University in Prague and the Czech journal *Anthropologie,* in publication since 1923.

Dr. Hrdlička's greatest contributions were in founding the *American Journal of Physical Anthropology,* of which he was editor from 1918–1942, and in establishing in 1929 the American Association of Physical Anthropologists, of which he was president from 1929 to 1932. To the journal he gave unstintedly of time, energy and devotion; in its formative years he was its financial "angel." To the association he gave years of wisdom and a rare, sympathetic insight into human nature. He was jealous of the reputation of the "science of anthropometry," feeling that "it will be practiced as long as man is interested in the study of his kind." In protecting this reputation he at times leaned over backward to guard against what to him seemed impractical innovations or extravagant or unwarranted claims and deductions.

Many honors came to Dr. Hrdlička: the chairmanship of the Anthropological Society of Washington (1907), Section H of the A.A.A.S. (1918), of the American Anthropological Association (1925–1926) and of the Washington Academy of Sciences (1929). He had an honorary Sc.D. from Prague (1922) and Brno (1926). He was a member of the National Academy of Sciences and of the American Philosophical Society.

In the Epilogue to "Alaska Diary" Dr. Hrdlička speaks of the volume as the views of "a medical man, an anthropological explorer, and a human human . . . a story of sustained, systematic assiduous search for evidence that might aid in clearing the aboriginal history of (Alaska)." This says what we all feel toward his memory: he was a great scientist, but first he was a warm-hearted, unselfish, lovable human being.

WILTON MARION KROGMAN
UNIVERSITY OF CHICAGO

RECENT DEATHS

DR. FREDERICK PAUL KEPPEL, dean of Columbia College from 1910 to 1918 and from 1923 to 1941 president of the Carnegie Corporation, died on September 8. Since his retirement he had served with the State Department in Washington as a member of the Board of Appeals on Alien Cases.

Nature reports the death of T. J. Jehu, emeritus regius professor of geology of the University of Edinburgh, and at the age of fifty-eight years of Sir Stopford Brunton, Bt., the Canadian mining geologist.

SCIENTIFIC EVENTS

GIFTS AND GRANTS TO THE UNIVERSITY OF ILLINOIS

TWENTY-NINE gifts and grants to the University of Illinois amounting to more than $127,000 were reported at the last meeting of the Board of Trustees. They are for research, for scholarships and for special items such as books.

The largest of the grants was $75,000 from the Upjohn Company, Kalamazoo, Mich., for a three-year study of the synthesis of penicillin which will be conducted by the department of chemistry, and in addition the company has provided $1,200 for a post-doctorate research assistantship in chemistry.

The sum of $1,200 was received from the Nutrition Foundation, Inc., New York, in support of research into the amino-acid requirements of man and of $2,400 to support research on calcium utilization by man. Grants were made by the William S. Merrell Company of $7,500 for fellowship stipends to support research in chemistry; by the John and Mary R. Markle Foundation, New York, $7,000 in support of research on high blood pressure; by the Allied Chemical and Dye Corporation, two fellowships in organic chemistry of $750 each; by Sharpe and Dohme, Philadelphia, $1,500 for study of certain animal diseases; by Cerophyl Laboratories, Kansas City, $1,200 for research in botany; by the Monsanto Chemical Company, St. Louis, $4,500 for a research fellowship on insecticides; by the Eastman Kodak Company, $1,000 for a fellowship in chemistry.

A gift of $500 was made by the W. K. Kellogg Foundation, Battle Creek, Mich., to the College of