certain distant points. These maps show all features of importance in a study to determine the most feasible route between terminals. The route may be for a railroad, highway, canal or transmission line.

Taken as a whole, the topographic maps are of major importance in planning engineering projects and securing their efficient and economic operation. These projects include tunnels, bridges, city surveys and planning, highway development and extension, irrigation projects, hydroelectric developments, improvement of rivers for navigation, flood control of rivers and general topographic surveying and mapping where a knowledge of elevations and geographic positions is required. In fact, there is scarcely any human activity of an extensive nature that does not need for its proper execution a very accurate knowledge of the elevation and slope of the ground and the accurate distances between points.

All these activities are customarily started with a survey and the production of a map or maps. With a topographic map available any such project can be started without the expense of preliminary surveys. Any details needing amplification can be quickly and economically added to the standard sheets or to photostatic enlargements by taking them into the field as a plane table sheet or by comparing them with a set of quickly secured aerial photographs.

Paper locations are rapidly and economically made on standard topographic maps, and safe preliminary estimates are easily made therefrom. Such maps disclose valuable information to the geologist, mining engineer, soil surveyor, regional planner, valuation engineer, forester, realty appraiser, hydraulic engineer and practically all the fifty-seven varieties of engineers who practice "the science and art of directing the application of the science of mechanics in the economic utilization of the forces and materials of nature."

The government mapping program contemplates making such a standard topographic map available for the whole territorial United States in less than two decades. This is a consummation devoutly desired and urged by engineers and engineering societies throughout the country for many years. We can not afford to be without it. As Major Bowie says, "A large paper could be written on the use of surveying and mapping to eliminate waste in industry."

The estimated cost of this program is $5,000,000 for the control surveys and $50,000, 000 for the mapping, or about one fifth of what the United States expects to save on naval expenditures by participation in the London conference.

The following states are completely mapped: Connecticut, Delaware, Maryland, Massachusetts, New Jersey, New York, Ohio, Rhode Island, West Virginia and the District of Columbia. These states have shown their appreciation of the topographic map by furnishing funds to insure completion.

The European countries are ahead of us in the matter of map appreciation. This is probably due to the importance of maps in connection with wars and the tourist trade, apparently the two principal occupations of much of Europe. Those who travel must know their Baedeker. Those who fight must have maps to plan their campaigns. The close-knit European countries have long been completely mapped, but you will note that the more thickly populated of our states are also mapped.

The writer wants to interject a thought here that for present-day needs it may be desirable to raise the standards of the topographic sheets to provide a larger-scale map with perhaps five-foot contours and still greater accuracy of detail. It is a fact that the present standard map, while of almost incalculable value, is nevertheless on such a small scale as to be in effect practically a sketch.

It may be that with the advantages of present-day aerial methods the same estimated expenditures will provide a higher standard for future maps with a resulting greater usefulness and further elimination of waste.

We are living in an age when maps are a basic need. Our engineers have long appreciated the value of good maps. It looks as if our government had reached the stage when it too realized the importance of maps in the economical conduct of affairs.

If Congress carries out the provisions of the Temple Act we will have in the next eighteen years a complete topographic map of the United States at a cost of less than a tenth of our annual expenditure for the military establishment or one tenth of the special appropriation for new cruisers.

OBITUARY

JAMES ARTHUR HARRIS

JAMES ARTHUR HARRIS died at Minneapolis, on April 24, following an operation for appendicitis. He was born on September 20, 1880, at Plantsville, Athens County, Ohio, son of Jordan Thomas and Ida Ellen (Lambert) Harris. His parents having moved to Kansas he entered the university at Lawrence and graduated there with the degree of A.B. in 1901. Going to St. Louis, he was botanical assistant at the Missouri Botanic Garden from 1901 to 1903 (working in the summers at Lawrence) and librarian of the garden from 1904 to 1907. Meanwhile he had taken

his Ph.D. degree at Washington University. From 1903 to 1907 he was instructor in general biology there. In the latter year he became investigator at the Station for Experimental Evolution (Carnegie Institution of Washington) at Cold Spring Harbor, Long Island, and continued there for seventeen years. In 1924 he was called to the chair of botany at the University of Minnesota where, as head of the department, he developed it in masterly fashion.

From the time of his attachment to the Carnegie Institution, Harris spent some time in other institutions and in the field. During 1908–09 he studied biometry under Karl Pearson at London. In the winters of 1912–13 he worked at the Desert Laboratory, Tucson, of the institution, and thereafter spent winter months at Tucson, at Jamaica, South Florida, and, in collaboration with the Bureau of Plant Industry, in the cotton experimental fields of the Southwest. This last work he continued after going to Minnesota. The Weldon medal and memorial prize of the University of Oxford were awarded to him in 1921.

Harris was one of the most industrious of investigators and prolific of writers in biology. Not infrequently he published fifteen or more papers in a single year. These covered a great range in detail, but fell into the following general classes: ecology, experimental evolution, biometry. His first paper, published in Kansas, 1900, was an annotated "Catalogue of the Crayfishes of Kansas," and this was followed by several papers on the crayfishes, culminating in his "Ecological Catalogue of the Crayfishes belonging to the genus Cambarius, 1903," which was, apparently, his doctor's thesis. In 1901 he published his first botanical paper ("Normal and Teratological Thorns of Gleditschia"). In 1903 he published on floral abnormalities and this topic interested him for many years; it led him particularly to consider the subject of variation in seeds in capsules. He became much interested in the pure-line theory and tested it out with beans. This led him to grow over a million seedlings. He discovered biotypes that had extra cotyledons.

A second series of papers grew out of his ecological interest. With R. A. Gortner he worked out a method of determining density of plant saps. This led to observations in the tropics and elsewhere and to the discovery of the greater sap density of parasitic plants over their host plants. It led to a study of the chemical differences in races of cottons corresponding to their morphological differences.

The third great interest of Harris was biometry. He had the statistician's love of numbers and he applied the Pearsonian methods to a great variety of animal and plant data, such as the egg laying of fowls, basal metabolism in man (with F. G. Benedict), and seedlings of the bean. His biometric work led him to work out new formulae of which many are of particular interest to geneticists.

Through all of Harris's work runs evidence of his interest in problems of evolution. He published not only on organisms in relation to environment, but also repeatedly on natural selection and on assortative mating (in man).

Of the personal traits shown by Dr. Harris, unlimited industry is one of the most striking. He never spared himself, and on one occasion when the nature of his research demanded continuous observation he worked during the midnight and early morning hours throughout the winter. He organized a biometric laboratory at Cold Spring Harbor and supervised the work of a large corps of assistants. In the field his energy was boundless. At Minneapolis he catalyzed a somewhat dormant botanical group, so that his department soon rose to a high rank. Harris had remarkable social traits. He inspired loyalty in his associates in the laboratory and in the field. His hospitality, with that of Mrs. Harris, was unbounded, and their home was the center of many social meetings of his associates. He was particularly happy in his married life. Mrs. Harris (Emma Lay) was also a naturalist. They had four sons in whom the family traits will, we feel sure, be continued. But the numerous societies in which he participated, often as officer, will miss him sorely. The loss brought by his death to his scientific associates will be only second to that suffered by his family.

C. B. DAVENPORT

RECENT DEATHS

DR. ALLERTON SEWARD CUSHMAN, chemist and founder of the Institute of Industrial Research in Washington, died on May 1, at the age of sixty-two years.

DR. CHARLES FRANCIS MCKENNA, consulting chemist of New York City, died on April 25, at the age of sixty-nine years.

MEMORIALS

A CENTENNIAL anniversary dinner in memory of the late Dr. Abraham Jacobi, who was born on May 6, 1830, and died on July 10, 1919, was held on May 2 at the New York Academy of Medicine. Professor Franz Boas, of Columbia University, was chairman of the committee of arrangements. The speakers announced were Dr. J. A. Hartwell, Dr. William H. Welch, Dr. Fielding Garrison, Miss Lillian Wald and Mr. George McAneny. Dr. Mary Putnam Jacobi, widow of Dr. Jacobi, was expected to attend. Dr. Jacobi became in 1860 the first professor in America of diseases of children, a subject which he taught for nearly fifty years.