

ROBERT A. MILLIKAN

1868 - 1953

"He strove always to make the world a better place in which to live, and he contributed far more than most men to this end."

DR. ROBERT A. MILLIKAN died on December 19, 1953, after an illness of several months. He was 85 years old.

"Dr. Millikan was one of the great pioneers and leaders of American science and of American higher education," said President DuBridge, in a tribute to his predecessor. "His name will always be linked with those of Wilhelm Roentgen, Madame Curie, J. J. Thomson, Lord Rutherford, Max Planck, Niels Bohr and Albert Einstein as one of those responsible for the revolution of modern physics.

"He led in creating in Pasadena one of the world's great centers of scientific research. The host of students whom he inspired, first in Chicago and later at Caltech, occupy positions of leadership in American science and in industry.

"Robert Millikan was a great man, a thoughtful man, a godly man. He strove always to make the world a better place in which to live, and he contributed far more than most men to this end."

Robert Millikan was 53 years old when he came to

Caltech in 1921 as chairman of the Institute's Executive Council and director of the Norman Bridge Laboratory of Physics. He had already had a full and a distinguished career in teaching and research at the University of Chicago, where he had been for 25 years. Nevertheless, at 53, he embarked on a challenging new career—and made as great a success of this as he had of his many others. Under his direction the California Institute of Technology became one of the world's leading scientific institutions.

Dr. Millikan retired as chief administrative officer of Caltech in 1945 and became vice-president of the Institute Board of Trustees and professor emeritus of physics. He continued his research and writing. During the summer of 1947 he made cosmic ray studies which took him from Texas to Canada. And, until his final illness, he kept regular office hours at the Institute—his one concession to his age being to spend an eight-hour day there instead of the 16-hour one which used to be his standard.

Actively engaged in physics research since 1895, R. A.

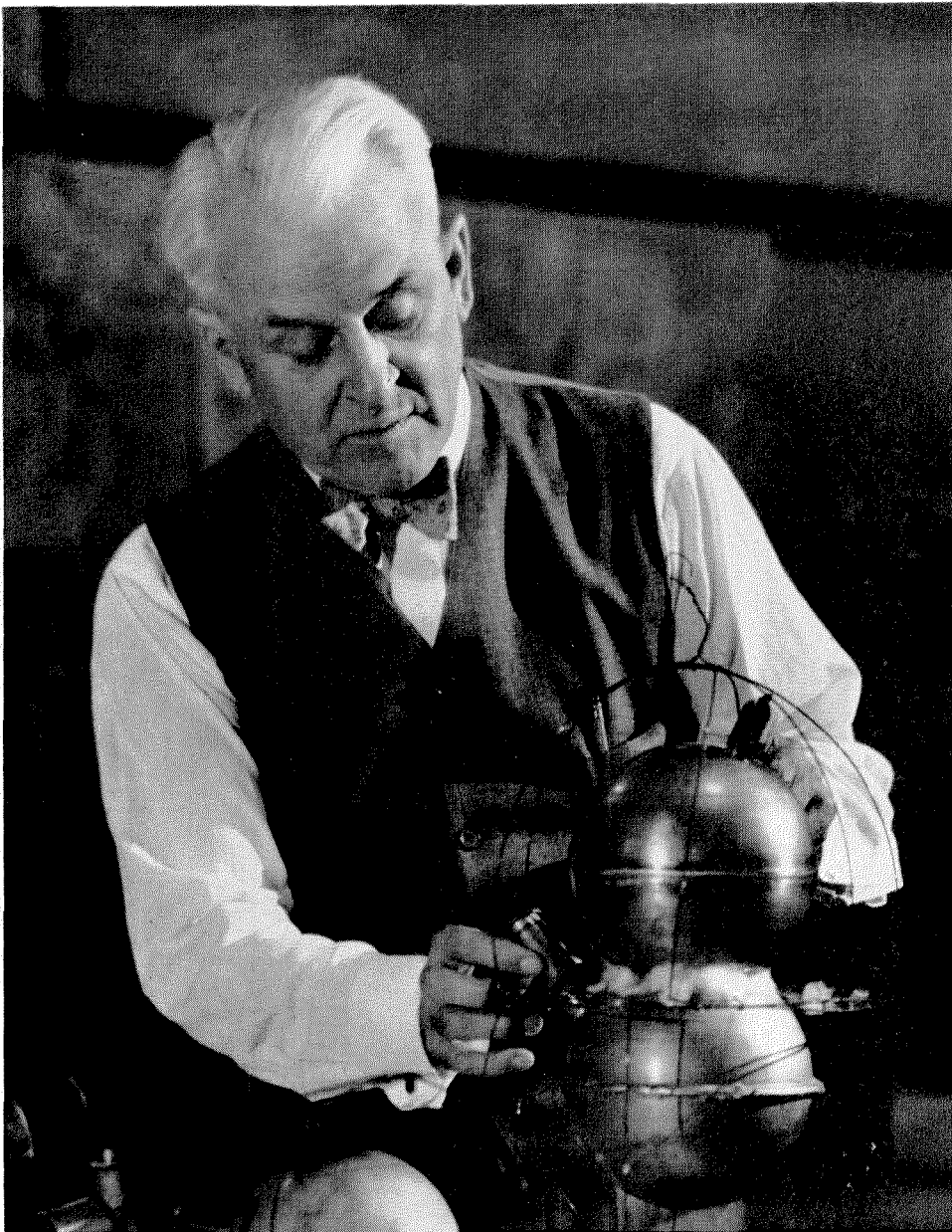


Photo by Will Connell, 1935

He performed a great service to science in calling attention to the significance of cosmic rays.

Millikan's name is synonymous with the development of 20th century physics in America. As President DuBridge has said:

"The present great strength and great activity of American physics—indeed of American science—are due in large measure to his achievements, his leadership, his influence, his keen vision in helping to establish on a national scale the firm foundation on which a thriving science could flourish."

Though he had a score of scientific contributions to his credit, Dr. Millikan became most widely known for his work on the isolation and measurement of the electron, for the photo-electric determination of the fundamental constant known as Planck's constant, and for the investigation of the character and distribution of cosmic rays.

His proof that electricity is composed of particles called electrons, that all electrons bear precisely the

same electric charge, and his accurate measurement of that charge is one of the classic experiments of modern physics—and one which provided a foundation for modern theories of electricity and the structure of atoms.

The Nobel Prize

His precision measurement of the ratio of the energy of a photo-electron to the frequency of the light that ejects it reinforced the evidence for Einstein's theory of the photo-electric effect (that light, like matter, is atomic in structure and exists in particles or chunks of a definite size) and was an important step in establishing the photon theory of the nature of light. This work, along with his determination of the electronic charge, led to his selection in 1923 as the second American to receive the Nobel Prize in physics.

He performed a great service to science in calling

attention to the significance of cosmic rays (it was he, incidentally, who named this penetrating radiation in the atmosphere) and, with the help of his students, using them effectively for revealing new elemental components of matter.

Robert Andrews Millikan was born in Morrison, Illinois, on March 22, 1868. He was the son of the Rev. Silas Franklin Millikan, a Congregational minister who preached for 40 years in Illinois, Iowa and Kansas, and the former Mary Jane Andrews, who had been dean of women at Olivet College in Michigan. Robert was the second of six children.

Between the ages of seven and eighteen he lived in Maquoketa, Iowa, and was graduated from the Maquoketa High School in 1885. The next year he entered Oberlin College (his parents' alma mater) in Ohio, where he received his A.B. degree in 1891 and his A.M. in 1893.

Introduction to physics

At Oberlin his major subjects were classical languages and mathematics. He was a good gymnast and athlete, and he worked as student director of the college gymnasium. He was, in fact, planning on a career in physical education when, in his junior year, he was asked to teach a class in elementary physics. ("Anyone who can do well in Greek can teach physics," he was told.) He had only had a one-semester course in the sub-

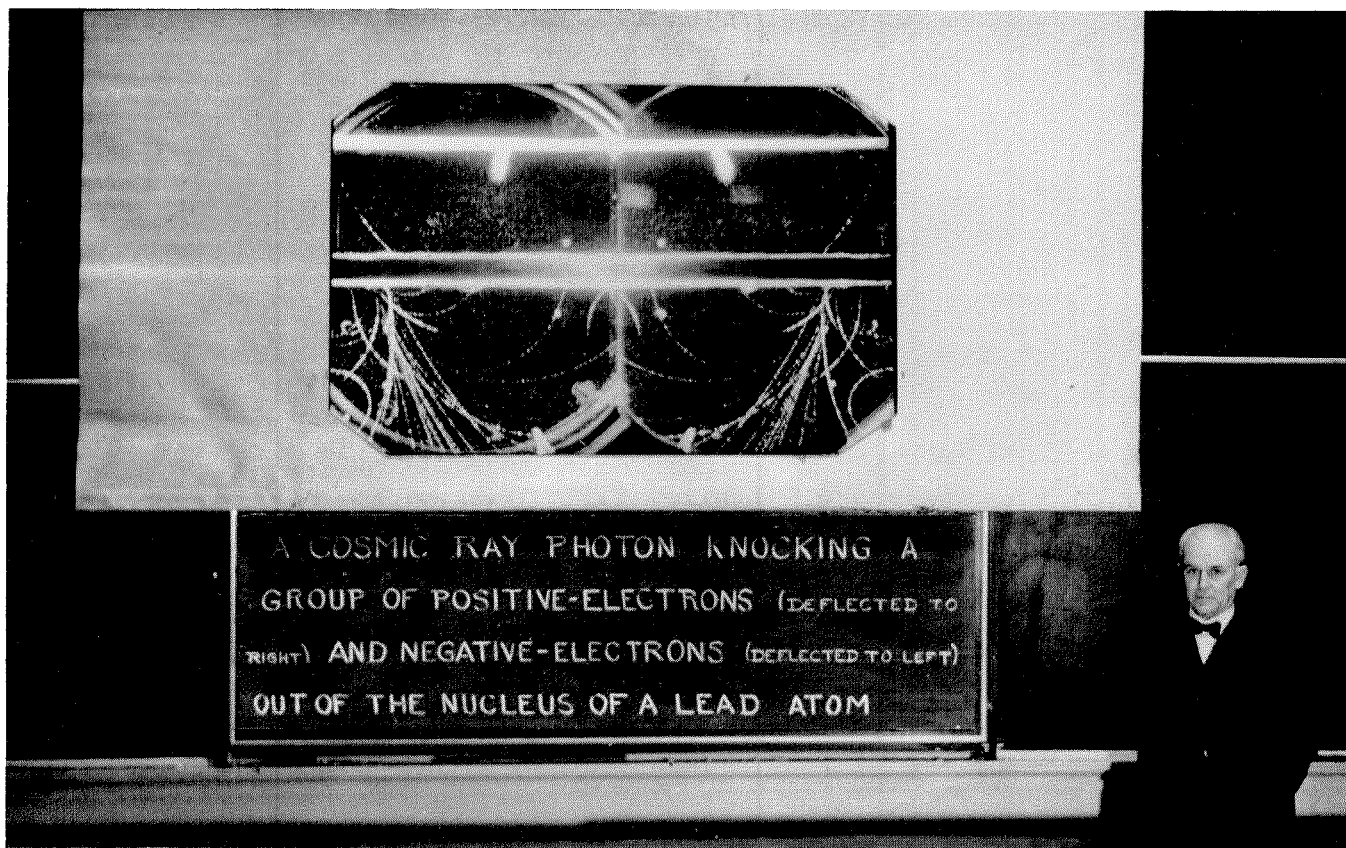
ject himself—and had considered it a complete loss because the textbook was dull and unintelligible—but as he studied on his own to prepare himself for teaching, he became completely absorbed in the subject.

Graduate studies

His interest grew during his next four years of part-time teaching and in 1893 he entered Columbia University for graduate work in physics. He was the only graduate student in this field. After receiving his Ph.D. in 1895, he spent a year abroad at the Universities of Jena, Berlin and Goettingen.

In 1896, at the age of 28, he was invited by Dr. A. A. Michelson, later the first American Nobel prizewinner in science, to come to the University of Chicago as an assistant in physics. By 1910 he had risen to professor of physics.

He was married in April, 1902, to Greta Blanchard of Oak Park, Illinois, whom he met while she was a student at the University. Mrs. Millikan died at their home in San Marino on October 10, 1953. They had three sons: Dr. Clark B. Millikan, professor of aeronautics and director of the Guggenheim Aeronautical Laboratory at Caltech; Dr. Max F. Millikan, professor of economics and director of the Center for International Studies at the Massachusetts Institute of Technology; and the late Dr. Glenn A. Millikan, a physiologist who was fatally injured in a mountaineering accident in 1947.



R. A. Millikan giving a lecture in 1933, explaining how his students (in this case Dr. Carl Anderson) were using the cosmic rays to reveal new elemental components of matter.



Above: Robert Millikan's parents, the Reverend Silas Franklin Millikan and the former Mary Jane Andrews.

Left: Millikan as a young man.

Much of Dr. Millikan's time during his early years in Chicago was spent in reorganizing the undergraduate courses in physics—emphasizing laboratory experiments and problem-solving, and correlating classroom and laboratory work. These pioneering methods were widely adopted in this country, as were the new textbooks he and his colleagues found it necessary to write.

As time passed he was able to devote more of his efforts to his research and to non-academic endeavors. He acted as a consultant in many fields of industrial research and was one of the leaders in the foundation of the National Research Council, of which he became vice-chairman and executive officer. This body was organized in 1916 by the National Academy of Sciences to mobilize American scientific resources for the government and soon became a vital force in the nation's war effort.

War activities

Dr. Millikan was called to Washington in connection with war activities in March, 1917, and remained there until 1919. The National Research Council was designated as the department of science and research for the Council of National Defense, and Dr. Millikan also

served on several other C.N.D. bodies, notably the General Munitions Board. He served throughout the war as one of the three civilian members of the Navy's Anti-Submarine Board and in July, 1917, was commissioned in the Army Signal Corps, serving as Lieutenant Colonel in charge of the Science and Research Division of the Bureau of Military Aeronautics. As a contemporary wrote, "There was hardly a single important military development of a scientific nature to which Millikan did not give personal attention."

He returned to the University of Chicago in 1919, and left to join Caltech two years later. He agreed to come to the Institute as director of the new Norman Bridge Laboratory of Physics—then one of the largest laboratories in the world devoted to research in pure physics—but he refused to accept the Caltech presidency. Instead, as he suggested, an Executive Council of trustees and faculty members was established to govern the Institute. Dr. Millikan became its chairman.

Paying tribute to Dr. Millikan on his 80th birthday in 1948, President DuBridge said:

"His new tasks (after coming to Caltech) were carried forward with such zeal, vigor and effectiveness that one who examines the history of his administrative achievements during the two decades after 1921 could

only be astonished that a single man could carry such a burden even though he gave it all of his time and attention."

His years at Caltech were among the most productive of his scientific career. And the Institute grew in stature as the ideals formulated by the astronomer George Ellery Hale, the chemist Arthur Amos Noyes, and Dr. Millikan began to be realized: A small institution devoted wholly to pure and applied science, based on the thesis that educating creative scientists could be accomplished only in an atmosphere of research.

The Chief

Many outstanding scientists were attracted to the Institute but most of all, said Dr. DuBridge, "these men were held together by the personal magnetism of 'The Chief' who personified these ideals."

Funds became available as needed, he added, "because Dr. Millikan and his associates acquired an extraordinary facility for capturing the imagination of leading men in the community, retaining their full confidence, and eliciting the essential support needed to meet urgent requirements to attain important goals."

In short, said Dr. DuBridge, "in his educational administration, as well as in his scientific work, Dr. Millikan's chief characteristic was imagination. His chief joy was entering new and unexplored fields. His greatest attributes were . . . vision and wisdom."

He was an exceptional teacher of research physics, as his colleague, Professor Paul S. Epstein of Caltech, has noted: "We find as his close associates, growing to manhood and fame in intimate collaboration with him, far more eminent physicists than can be accounted for by the law of averages. On the strength of this record, (he) must be classed as one of the most successful teachers in the history of science."

Honors and awards

His honors were many. He was awarded 25 honorary degrees, seven of them by foreign universities. He received, among numerous other awards, the Hughes Medal of the Royal Society of Great Britain, the Faraday Medal of the London Chemical Society, the Oersted Medal of the American Association of Physics Teachers, and the decoration of Commander of the French Legion of Honor. He was awarded the Presidential Medal for Merit for his outstanding services during World War II.

He was a member or honorary member of many American and foreign learned societies and had held various offices in the National Academy of Sciences, American Physical Society, American Philosophical Society and American Association for the Advancement of Science.

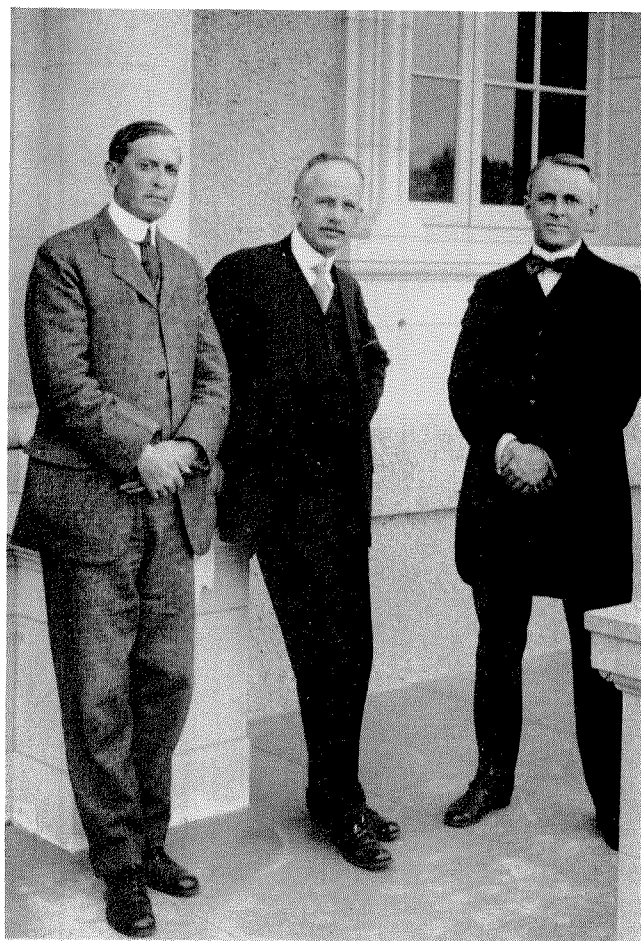
Dr. Millikan was active for many years in civic affairs in Los Angeles and Pasadena. He was chairman of the Board of the Henry E. Huntington Library and Art Gallery in San Marino, a member of the Board of the Neighborhood Church in Pasadena, and a member of the Advisory Committee of the Los Angeles County Hospital.

He received the highest honor of the City of Pasadena, the Arthur Noble Award, conferred for outstanding community service.

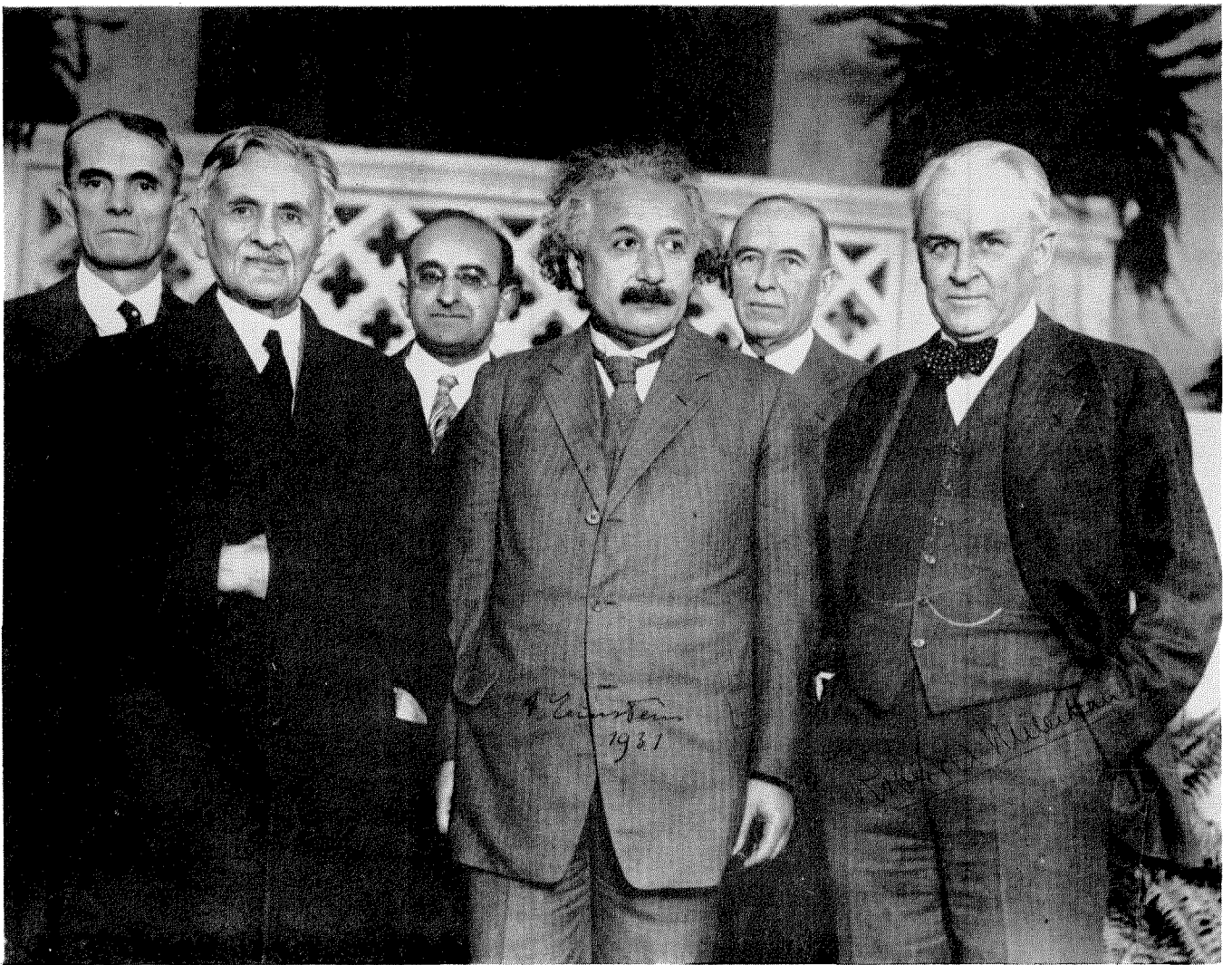
He was the author or joint author of a score of books, the first, *A College Course in Physics* published in 1898. This was followed by a dozen other textbooks for secondary school or college use, some of which are still standard works. He also wrote a number of books of a philosophical nature, such as *Evolution in Science and Religion*, *Science and the New Civilization*, and *Time, Matter and Values*. His latest book was his autobiography, published in 1950.

Religion, to him, was not the antithesis but the complement of science. "Human well-being and all human progress," he wrote in his autobiography, "rest at bottom upon two pillars, the collapse of either one of which will bring down the whole structure. These two pillars are (1) the spirit of religion, (2) the spirit of science (or knowledge)."

"The purpose of science," he wrote—quoting a statement he had helped prepare, in 1923 with a group of leaders in science, religion and public affairs—"is to develop, without prejudice or preconception of any kind, a knowledge of the facts, the laws, and the processes of nature. The even more important task of religion, on the other hand, is to develop the consciences, the ideals, and the aspirations of mankind."



Arthur Noyes, George Hale and Robert Millikan in 1921—shortly after Millikan became head of Caltech.



A. A. Michelson, Albert Einstein and Robert Millikan, at the Athenaeum, 1931. In the back row are Walter Adams, director of the Mt. Wilson Observatory; Einstein's assistant; and Max Farrand, director of the Huntington Library.

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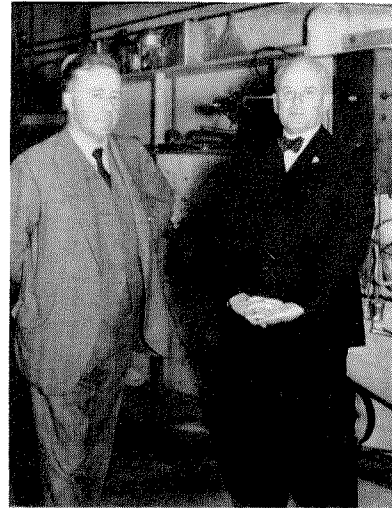


Mr. and Mrs. Herbert Hoover

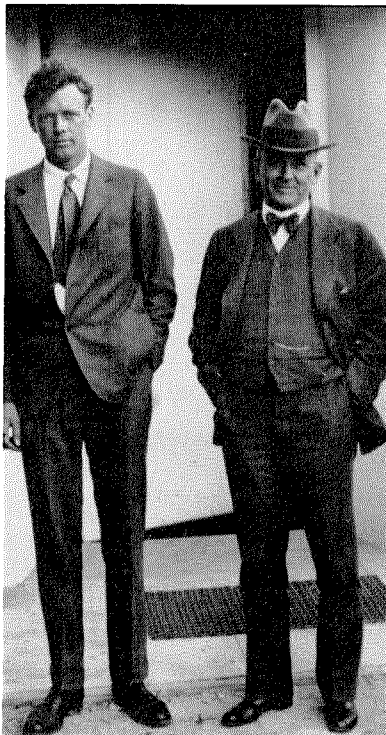
A man with as many interests as Robert Millikan meets a good many different kinds of people. The pictures on these pages, from Dr. Millikan's own collection, record a few of these meetings.



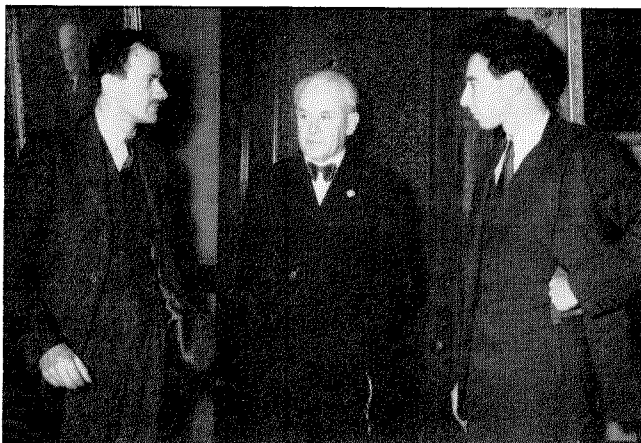
G. Lemaitre, 1933



Sir James Jeans, 1931



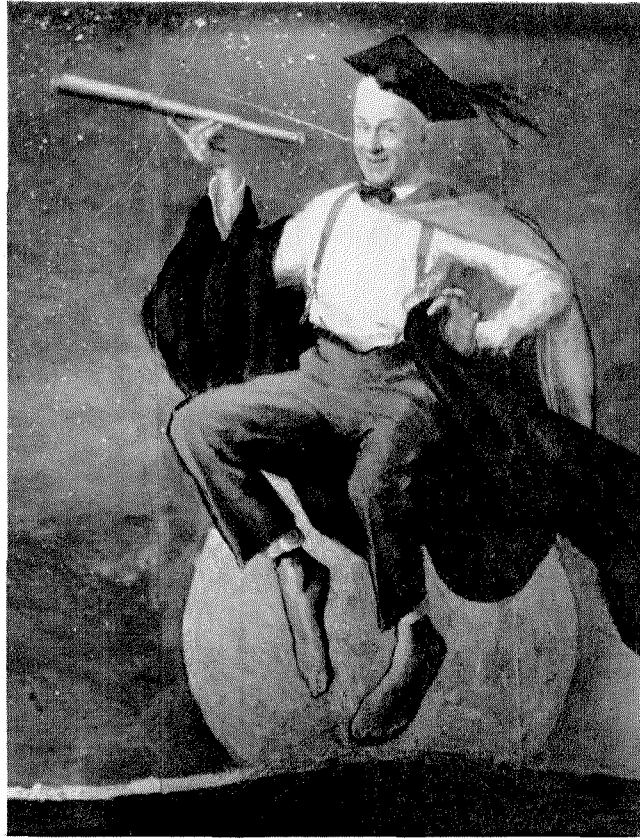
Charles Lindbergh, Jr.



Paul A. M. Dirac and J. R. Oppenheimer, 1935

Albert Einstein →





Above: The famous caricature by Arthur Cahill, done in 1936. A huge (12' x 15') colored crayon drawing, it hangs in the basement of the Athenaeum on campus.

Below: Luncheon at the Huntington Library in 1947—two years after his retirement as head of Caltech—with James R. Page and William B. Munro.



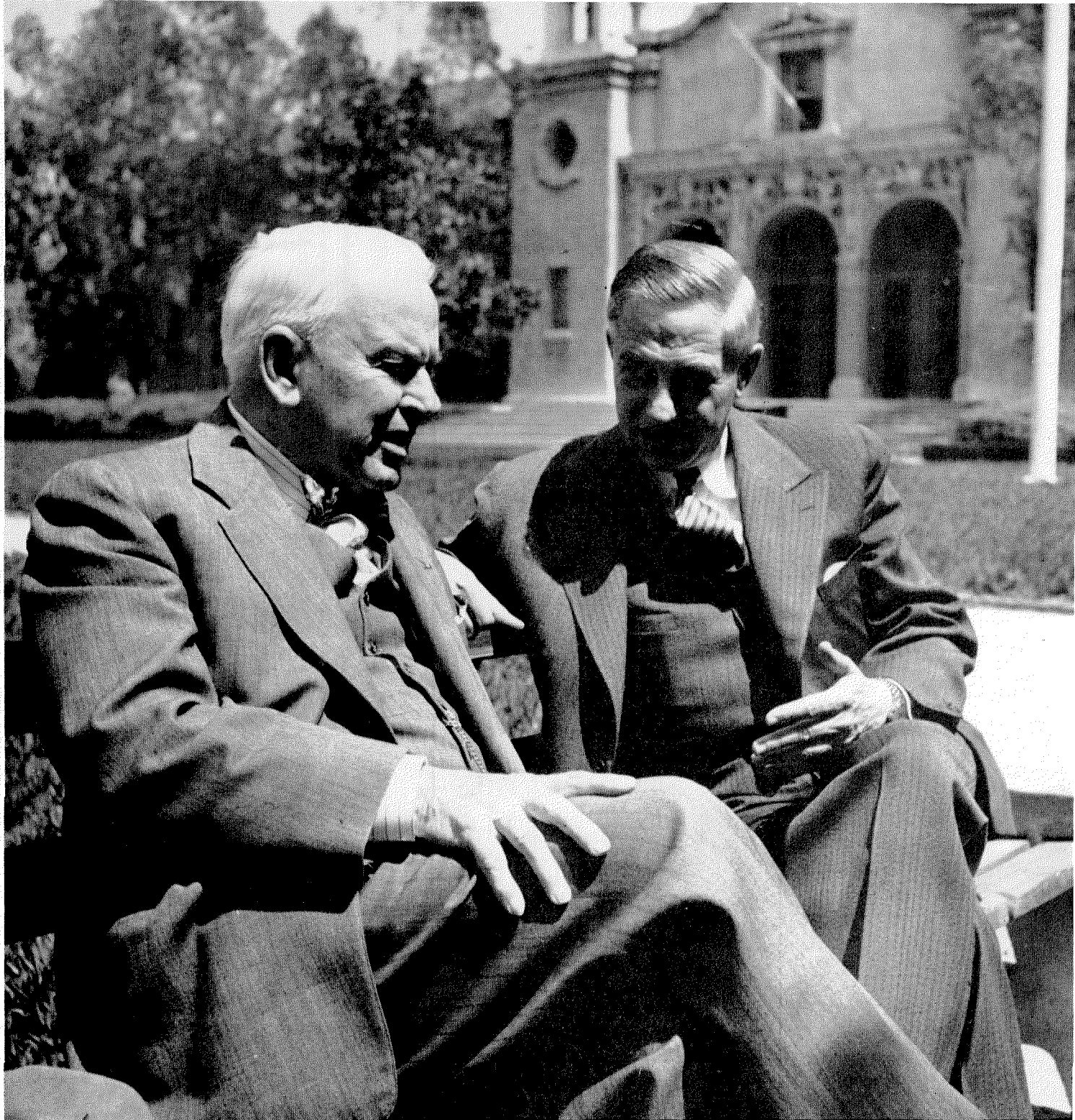


Photo by Ernest Kleinberg

*Conference on the campus with President DuBridge,
his successor as head of Caltech — in April, 1951.*