

THE FRANKLIN INSTITUTE

COMMITTEE ON SCIENCE AND THE ARTS

No. 3026
and 3027

Subject THE FRANKLIN MEDAL

Applicant _____

Address _____

Date of Application _____

Inventor _____

Address _____

COMMITTEE:

Dr. Frederic Palmer, Jr. *Chairman*

Dr. James Barnes

Mr. Theobald F. Clark

Dr. H. Jermain Creighton

Mr. Clarence A. Hall

MEETINGS:

October 20, 1936.

November 4, 1936.

Report presented to
General Committee:

December 9, 1936.

Final Action:

January 13, 1937.

Award Franklin Medal

To Dr. Robert Andrews Millikan and
Dr. Peter Debye.

Report, Medal, and Certificate ^{presented} ~~presented~~ to ^{Dr. Millikan} ~~to~~

June 25, 1937.

~~Report, Medal, and Certificate~~ presented to Count van Recteren Limpurg, May 19, 1937, for transmission to Dr. Debye.

THE FRANKLIN INSTITUTE OF THE STATE OF PENNSYLVANIA
FOR THE PROMOTION OF THE MECHANIC ARTS

Hall of the Institute,
Philadelphia, January 15, 1937.

Report No. 5026.

Investigating The Work of

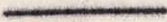
Doctor Robert Andrews Millikan,

of Pasadena, California.

Application dated _____

THE FRANKLIN INSTITUTE OF THE STATE OF PENNSYLVANIA

For the Promotion of the Mechanic Arts



Doctor Millikan was born in Torrington, Illinois, on March 22, 1896, the son of the Reverend Elias Franklin Millikan, a Congregational minister, and Mary Jane Andrews, born of Water in Illinois. His parents were graduates of Oberlin College, which they attended in Philadelphia, January 15, 1937.

Committee on Science and the Arts Case No. 3026.

The Franklin Institute of the State of Pennsylvania, acting through its Committee on Science and the Arts, has considered carefully the work of those who have contributed greatly to the advancement of science and to the application of physical science to industry, and has selected as the recipients of the two awards of the Franklin Medal for 1937 -

- ROBERT ANDREWS MILLIKAN, of Pasadena, California, - and
PETER JOSEPH WILHELM DEBYE, of Berlin, Germany.

The award to Dr. Millikan is

In recognition of his isolation and measurement of the fundamental unit of electricity, the electron; the photoelectric determination of the fundamental constant of radiation, Planck's constant; the extension of the ultraviolet spectrum by two octaves to join the spectrum of soft X-rays; and the study of the nature and the

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1 properties of a very penetrating radiation of cosmic
2 origin.

3
4 Doctor Millikan was born in Morrison, Illinois, on March 22,
5 1868, the son of the Reverend Silas Franklin Millikan, a Congregational minister,
6 and Mary Jane Andrews, Dean of Women in Olivet College, Michigan. Both parents
7 were graduates of Oberlin College, which thus appropriately became the alma mater
8 of their son, Robert, who received his Bachelor of Arts degree there in 1891.
9 During his undergraduate days, Millikan took only one course in Physics and that
10 for only one semester. The major part of his scholastic work was in Greek and
11 Mathematics, while at the same time he took a prominent part in student activities,
12 athletic, social, and intellectual. Upon his graduation, the Oberlin faculty were
13 loath to lose the influence of such a popular and versatile student, hence they
14 appointed him Tutor in Physics, a position he held for two years. Although ill-
15 prepared to fill such a position, Millikan became absorbed in his subject through
16 the necessity of teaching it - a fact which may account for his abiding interest
17 in the teaching of Physics in spite of the demands of research and executive work.

18 After two years at Columbia, Millikan received his Ph.D. degree
19 in 1895, and spent the following year at Berlin and Göttingen. Upon his return
20 from Europe he received an appointment at the University of Chicago, where he
21 remained for twenty-five years, and where his great work on the measurement of
22 the electronic charge and on the determination of Planck's constant was done. In
23 1921 he became the Director of the Norman Bridge Laboratory and chief executive of
24 the California Institute of Technology, where he has gathered together a brilliant
25 group of men through whose efforts the Institute has become one of the world's

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1 chief centers for scientific research.

2 Doctor Millikan accomplished the isolation of an ion and the
3 measurement of the electronic charge by observing the motion of a charged droplet
4 of oil as it captured ions during its rise and fall in the space between two
5 parallel electrically charged plates. This work furnished conclusive proof of
6 the atomic structure of electricity. Further, since the product of the electronic
7 charge by Avogadro's number was already known, this precision determination of the
8 charge led at once to an exact evaluation of the number of molecules in a gram-
9 molecule, from which can be calculated the number of molecules in any mass of
10 any simple substance "with as much certainty as can be attained in counting the
11 inhabitants of a city."

12 In order to determine the magnitude of Planck's constant, h ,
13 Millikan constructed a veritable "machine-shop in vacuo" which enabled him to
14 carry out a series of operations and measurements upon specimens of several dif-
15 ferent metals, whereby the ratio of the potential necessary to stop the emission
16 of electrons from a freshly cut metallic surface to the frequency of light which
17 illuminated that surface was found to be a constant, according to Einstein's
18 photoelectric equation. The magnitude of the constant was h/e , where e is the
19 electronic charge as found from the oil-drop experiment, hence h was readily
20 calculated. This constituted the first direct experimental establishment of the
21 validity of the photoelectric equation suggested by Einstein eleven years before,
22 an equation now of as much importance as the celebrated electromagnetic equations
23 of Maxwell.

24 The work on the extension of the ultra-violet spectrum, reported
25 in a series of papers from 1920 to 1923, pushed the limits of explored frequencies

1 in the ultra-violet two octaves farther down. This study completed the work
2 begun by Moseley in establishing the order of progression, that is - the atomic
3 number, of the elements by means of the only reliable agency for so doing, namely,
4 the character of the radiation emitted by the constituent electrons within the
5 atom.

6 By means of hot sparks between metal electrodes in vacuo, Millikan
7 and Bowen extended the laws of spectral emission by atoms which have been stripped
8 of one or more electrons into the region of the extreme ultra-violet.

9 Many of these ultra-violet lines showed fine structure, the cause
10 of which was found by Uhlenbeck and Goudsmit, who utilized, in part, the results
11 of these experiments in verification of their newly developed conception of the
12 spinning electron.

13 In 1924 Millikan and Cameron employed electroscopes both unshielded
14 and shielded with lead or varying depths of water to investigate the character of
15 the penetrating radiation known to exist at the earth's surface. This they found
16 came into the earth's atmosphere from all directions with nearly equal intensity,
17 and hence originated, in all probability, somewhere beyond the solar system.
18 From that time to the present Millikan and his collaborators have continued to
19 increase our knowledge of these cosmic rays by carrying on their experiments
20 both under water and high in the air, from the equator nearly to the arctic regions;
21 by the design of very light automatic recording instruments which are carried by
22 small free balloons into the stratosphere and return to earth on a parachute when
23 the balloons break; and by the application of new methods of attack, such as the
24 Wilson cloud chamber containing a metallic sheet, which resulted in the discovery
25 of new effects of cosmic radiation upon matter, and led to Anderson's discovery,

1 in the Norman Bridge Laboratory, of a second kind of fundamental atom of
2 electricity, namely, the positron.

3 During the war period, Doctor Millikan served on the General
4 Munitions Board and the Optical Glass Committee as well as on other committees
5 of the Council of National Defense. He was one of three civilians and four
6 naval officers composing the Anti-Submarine Board in charge of the research
7 station at New London, Connecticut. In July, 1917, he received a commission
8 in the United States Army and served throughout the remainder of the war as
9 lieutenant-colonel in charge of the science and research division of the Bureau
10 of Military Aeronautics. In 1923 he was the American member of the Committee
11 on Intellectual Coöperation of the League of Nations.

12 Doctor Millikan has been the recipient of honorary degrees from
13 twenty colleges and universities in this country and abroad, among which are
14 Columbia, Yale, Princeton, Harvard, California, Michigan, Dublin, Leeds, King
15 John Casimir (Poland), Ghent, Liege.

16 He is a Fellow of the American Academy of Arts and Sciences, a
17 member of the National Academy of Sciences and the American Philosophical Society;
18 a past president of the American Association for the Advancement of Science as well
19 as of the American Physical Society; an honorary member of the Royal Institution
20 of Great Britain; a member of the Royal Irish Academy, the Institut de France, the
21 Royal Academy of Belgium, the Academie des Sciences de Russie; and has membership
22 in other scientific organizations in Leyden, Rotterdam, Göttingen, Munich, and
23 Liege.

24 Professor Millikan has written, individually or in collaboration,
25 fourteen books, half of them text-books for school or college, all of them

1 characterized by clarity and simplicity of style as well as by forceful
2 exposition. He is a frequent contributor to scientific journals.

3 He received the Comstock Prize for research in electricity from
4 the National Academy of Sciences in 1913, the Edison Medal from the American
5 Institute of Electrical Engineers in 1922, the Hughes Medal from the Royal
6 Society of Great Britain in 1923, the Nobel Prize in Physics in 1923, the
7 Faraday Medal from the Chemical Society of London in 1924, the Matteucci Medal
8 from the Societa Italiana della Scienze in 1925, the Gold Medal from the American
9 Society of Mechanical Engineers in 1926, the Messel Medal from the Society of
10 Chemical Industry (British) in 1928, the Gold Medal from the Society of Arts and
11 Sciences in 1929, the Gold Medal from the Roosevelt Memorial Association in 1932,
12 and in 1931 he was created Chevalier de l'Ordre National de la Legion d'Honneur.



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15 *Nathan Hayward*
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16 President.

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18 *Henry B. Allen*
.....
19 Secretary.

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21 *John A. Vagstad*
.....
22 Chairman of the Committee on Science
23 and the Arts.
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