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FOR PERMANENT RECORD
FILE IN MEMBER FOLDER

MICHAEL IDVORSKY PUPIN (1858–1935)

Fellow in Class I, Section 2, 1905

Michael Pupin lived a life of fruitful activity for seventy-seven years. He earned distinction in mathematical physics and electrical communications. He had a strong taste for invention in the field of

applied electrictiy because of its service to humanity, and here he likewise earned distinction. Moreover, he was a philosopher and a romantic. Indeed, he was, himself, a romance.

He was born of peasant parents on October 4, 1858, at Idvor, a village of peasants in the Banat province of old Austria, which was peopled by Serbs; and his parents were of the Serbian race like their neighbors. These people of the Banat were mostly illiterate (in the sense of being unable to read and write) but were full of biblical interpretations, folk-tales, Serbian ballads, and warrior's stories. Young Pupin spent his early years in this peasant setting. His youthful mind was also filled with speculative activity aroused by the stimulating view of wide agricultural lands by day and brilliant stars by night, which views seem to have exerted a deep influence on his mind even while he performed the conventional physical labors of the life of a peasant boy in the pastures and vineyards of the Banat. He never lost from his life the sense of a deep, spiritual philosophy which was implanted in those days. Also, at the instance of an uncommonly sympathetic and wise mother, though herself without formal schooling, he secured the schooling available near home and then attended school at Prague until he was sixteen years of age.

The repressive and narrow outlook in his home land for an ambitious and romantic boy of mental and physical vigor turned his mind and then his being toward America, the land of Benjamin Franklin and Abraham Lincoln. He started for the United States in March, 1874, on his lone responsibility; and he arrived on Manhattan Island, according to his autobiography, possessing only a Turkish fez, the clothing which he was wearing, and five cents in money. He had made the cold and stormy ocean crossing in March without even possessing mattress or bedding for his steerage bunk. He had no relatives nor acquaintances in America and he confessed to the immigration authorities that his knowledge of our nation consisted of little more than the names and some traditions of Franklin, Lincoln, and Harriet Beecher Stowe.

Fortunately admitted to the United States under the then existing liberal immigration laws, he sought for work. The country was still in the clutch of the great depression of the seventies, and work was not plentiful; but, through farm work in Delaware, Maryland, and New Jersey, and odd jobs in New York City and Brooklyn, he made

his way through hardships which only one of great physical endurance and mental purposefulness could have sustained. Happily, he fell in with people in lowly walks of life who advised him well. His reading was of the great American patriots, and his contacts widened until he was given all-round encouragement to prepare for college. In 1879, the fifth year after arriving in this country, he passed entrance examinations for Columbia University with a high record which admitted him to the University free of tuition fees. In college he became equally noted among his classmates for scholarship in mathematics and Greek, and for prowess in wrestling and boxing. He was "class president" in his junior year. Thereafter his personal qualities, physical vigor, grasp in learning, sound enthusiasm for mental and physical activity of helpful character, and readiness in friendships with interesting people carried him forward throughout his always interesting and ultimately distinguished career. He had a genius for friendship with people of intellectual quality and guiding spiritual influence. To his great joy he became a naturalized American citizen the day before his graduation into the Bachelor of Arts degree at Columbia in June, 1883.

Pupin now possessed a fair acquaintance with the classics and mathematics; but his ambition had become set on science, and particularly on electromagnetism as developed by the works of Faraday and Maxwell. His scholarship at Columbia rated him support for further study, and he sailed for Europe to visit his old mother at Idvor for the first time since his departure for school at Prague; and then to enter Cambridge University (England) to study under the spirits of Newton and Maxwell. Maxwell had been dead for some four years, and neither Lord Rayleigh nor J. J. Thomson (who succeeded to physics in the University) were Maxwell devotees. This was a disappointment to Pupin, but he remained at Cambridge until 1885, concentrating his study on mathematics, although apparently reading much regarding Faraday, Maxwell, and La Grange. In one summer he learned French because "The names of Laplace, La Grange, and Ampère were mentioned so often and with so much veneration by Maxwell that I felt ashamed of my ignorance of the language of France," and then, feeling "enriched by a good knowledge of a great civilization," he read La Grange's Méchanique Analytique in the original.

Attracted by the reputation of Helmholtz in experimental physics, he migrated to the University of Berlin to study under that master. He was the first holder of a Tyndall Fellowship of Columbia University. It was here that he absorbed with his usual concentration, Helmholtz's notable interpretations of the Maxwellian theories. While thus a student still in Berlin, he heard in the latter part of 1887 an announcement by Helmholtz of Hertz's experimental verification of Maxwell's theory of electrical waves in space, and a eulogy of Hertz who had been a student of Helmholtz. Early in 1889 he received from the University of Berlin the Ph.D. degree for his work with Helmholtz, which was crowned by a mathematical research and thesis in physical chemistry—a field in which Helmholtz took great interest at the time.

It was in 1888 that Pupin became engaged to Sarah Katharine Jackson, sister of one of his Columbia classmates then also studying in Europe. A beautiful example of his purposeful tenacity lies in his following the girl from place to place in Europe, as she moved about with her mother for visiting and sight-seeing, until she accepted his suit; whereupon he hastened to New York to try to secure a job. Happily that was to be had promptly as "Teacher of Mathematical Physics in the Department of Electrical Engineering" of Columbia University. Thereupon, returning to Europe, he was married in London and returned to Berlin to finish the work for his doctorate.

The autumn of 1889 found him established in his post at Columbia University. Then began his notable creative career in teaching, writing, and inventing. His was an extraordinary influence on students in classroom and laboratory. His five articles published in Transactions of the American Institute of Electrical Engineers in the decade 1890–1900 are now historical classics, as likewise are several articles in other fields published in other journals. Of his three books, published for general consumption, his autobiography called "From Immigrant to Inventor" is a contribution to the literature of American life and idealism.

At the time that he assumed his position in the staff of Columbia University the electrical engineering laboratory was meagre in space and meagre in equipment. The physics equipment of the University was not planned for experimental research. However, Pupin started industriously to work with lean and extemporized equipment toward

the answer to various questions fermenting in his mind. This led to inventions relating to oscillating circuits and rectifier devices, at least some of which later proved of value to the Marconi Company when developing its processes of radio communications.

Upon publication of Roentgen's discovery of X-rays, Pupin started to work actively in research relating to their application in surgery, and particularly to methods of X-ray photography. He also independently discovered secondary radiation of X-rays.

His principal invention, however, made in the latter part of the decade of the nineties, was in loading telephone lines with self-inductance in a manner to improve speech transmission. Thus arose the well-known Pupin "loading coils."

It was already known that addition of self-inductance in overhead telephone circuits would be helpful. Increasing the distance between outgoing and incoming conductors of a pair composing a telephone circuit had been proposed, but was not physically or economically feasible. Introduction of coils at intervals apparently had been tried but proved without utility. Pupin solved the problem by an intellectual process which is a monument to his mental fertility. He was familiar with the well-known La Grange solution of the equation for a vibrating string loaded with pellets. Having achieved a solution which included the effects of abstracting energy by the drag of a viscous medium, he was impressed by the analogy to conditions of flow of alternating current in an electric circuit where it is desired in the process of transmission to preserve the fidelity of an impressed vibratory wave train. He soon had formulas which displayed specifications for the self-inductance to be provided in coils, and the frequency of the location of the coils, in any telephone circuit of known physical construction and desired performance. Experimental tests of models completely verified his theoretical predetermination. The intellectual process of Pupin,—of conception, use of abstract science for drawing inferences together, and verification by laboratory experiment,—place this invention on the high level occupied by the group of the most beautifully intellectual of American inventions.

At the opening of the twentieth century it was thought that this invention was possibly the reed upon which could lean the economical development of telephony through aerial wires over very long distances. It did aid in that direction. On the advent of the triode

vacuum tube and vacuum tube telephone repeaters, they usurped that field, but the Pupin loading coil still holds an important place in many aspects of telephone plant.

At the time of retiring from his active position in Columbia University to become Emeritus Professor, with the intention of continuing in active research, his title was Professor of Electromechanics. This was in 1929. His health was not good in the latter years of his life. He died on March 12, 1935.

He was active in organized affairs relating to science, throughout his life. He became a member of the American Institute of Electrical Engineers in 1890, was its President in 1925–26, and was an Honorary Member at his death. He was a charter member of the American Physical Society, which was organized in 1899, and was a member of the American Mathematical Society. He was President of the Institute of Radio Engineers in 1916 and President of the American Association for the Advancement of Science in 1926. He was Chairman of the Engineering Foundation for a period after the United States entered the World War, was instrumental in the aid which that Foundation gave to the establishment of the National Research Council, and for a time he participated actively in the work of the latter. He was a member of the National Academy of Sciences and the American Philosophical Society, besides other scientific societies at home and abroad. He became a Fellow of the American Academy of Arts and Sciences in 1905.

He is reputed to have received as many as eighteen honorary degrees from educational institutions. His inventions and their service to mankind brought him many medals. In 1902 he received the Elliot Cresson Medal of the Franklin Institute; in 1916 the Prix Hébert of the French Academy of Sciences; in 1920 the Edison Medal of the American Institute of Electrical Engineers and the Gold Medal of the National Institute of Social Sciences; in 1924 the Medal of Honor of the Institute of Radio Engineers; in 1928 the Washington Award of the Western Society of Engineers and the Four Founder Engineering Societies; in 1932 the John Fritz Medal of the Founder Engineering Societies.

Beginning with 1909, he gave much attention to the welfare of Serbian immigrants in this country; and he gave aid to Serbia during the World War.

Those who knew Pupin personally will understand how characteristic of his enthusiasm is the remark made in his autobiography relating to his student days in Berlin while he was ruminating on the works of Faraday and Maxwell and their interpretations by Helmholtz: "I do not know how difficult it is to conceal a deep secret, because I never had one to conceal; but I do know how hard it is to keep imprisoned in one's heart the joy which one feels when the light of new knowledge rises above one's mental horizon." The first nine chapters of that autobiography, which bring him to his ultimate academic career, are a contribution to distinguished literature. They can be reread with the same lively interest as may be found in rereading the autobiography of Benjamin Franklin or of John Brashear.

DUGALD C. JACKSON.