

MICHAEL I. PUPIN

*File in
Permanent Folder
of Mr. J. Pupin
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Michael Idvorsky Pupin was born in Idvor, Banat, in Southern Hungary (now Yugoslavia), October 4, 1858. After completing his primary education at the village school, he attended a high school in Prague.

He emigrated to the United States in 1874, entered Columbia University, New York, in 1879, and was graduated with the degree of B.A. in 1883. He afterward studied mathematics at the University of Cambridge, England, and physics at the University of Berlin, holding, while in Berlin, the John Tyndall fellowship of Columbia University.

After receiving his degree of Ph.D. in 1889, in Berlin, he returned to Columbia University as Instructor of Mathematical Physics. In 1892, he became Adjunct Professor of Mechanics, and in 1901 was appointed Professor of Electro-Mechanics. He was appointed director of the Phoenix Research Laboratory of Columbia University in 1903, and retained this position as well as his professorship until 1929, when he retired from active service with the title Professor Emeritus in Active Residence.

Dr. Pupin is widely known for his important inventions, his significant contributions to knowledge in alternating current theory, the passage of electricity through gases, long distance communication, and many other scientific subjects, and his many publications.

Throughout his career, his scientific studies have been pursued intensively, and he has received eighteen honorary degrees, including the following: Doctor of Science from Columbia University, Doctor of Laws from Johns Hopkins University, and Doctor of Engineering from Case School of Applied Science, and Polytechnicum (Prague).

Dr. Pupin joined the American Institute of Electrical Engineers in 1890, and was transferred to the grade of Fellow in 1915. In 1928, he was elected an Honorary Member.

He is a Past-President of the American Institute of Electrical Engineers and of the Institute of Radio Engineers, and is a Past-Chairman of the Engineering Foundation.

The medals received by Dr. Pupin include the following:

- Edison Medal, American Institute of Electrical Engineers, 1925.
- Medal of the Institute of Radio Engineers, 1924.
- Cresson Medal, Franklin Institute, 1902.
- Prix Herbert, French Academy, 1916.
- Social Science Medal, 1920.
- John Fritz Medal, awarded by representatives of 1932
 - American Institute of Electrical Engineers
 - American Society of Mechanical Engineers
 - American Society of Civil Engineers
 - American Institute of Mining and Metallurgical Engineers

Lists of his inventions and publications are attached.

FROM: American Institute of Electrical Engineers,
33 West 39th Street, New York, N.Y.

12-21-34

*(Documents sent to Helmer
Metal Bond of award
12-21-34)*

DR. M. I. PUPIN

INVENTIONS

Professor Pupin's chief invention was that of the loaded telephone line which at the time extended the economical range of long distance telephone communication. Due to the diminution of the intensity of the telephonic electrical current with increasing distance from the source, telephone conversations over wires were formerly limited by certain practical factors, such as the size of and spacing between the two wires. Loading consists in the insertion of inductances at intervals in the wires to compensate in part for the capacity between the two wires. Professor Pupin proposed a rule for the spacing of these inductances along the conducting wires, which was useful in planning the experimental telephonic tests which established the commercial spacing of loads.

Others of the more important accomplishments of Professor Pupin are the following:

He first clearly understood and described in a paper published in 1896 the nature of the secondary x-ray radiation, which he condensed into the statement: "Every substance when subject to the action of the x-ray becomes a radiator of these rays."

Second. Electrical tuning, which is the backbone of radio broadcasting. Pupin's patents covering this invention were acquired from him by the Marconi Company of America in 1902. The full importance of the invention, however was not demonstrated until the invention of the vacuum tube oscillator which enabled us to produce continuous electrical oscillations.

Third. Rectification of high frequency electrical waves was first accomplished by him and published in November, 1899, in the Bulletin of the American Physical Society.

Fourth. Rapid x-ray photography by the employment of a fluorescent screen over the photographic plate was invented and described by him in 1896 and is now widely used.

PUBLICATIONS

Books

- "From Immigrant to Inventor", Scribners, 1923.
- "The New Reformation", Scribners, 1927.
- "Thermodynamics"
- "Romance of the Machine", Scribners, 1930.

ARTICLES

Der Osmotische Druck und seine Beziehung zur Freien Energie.
Inaugural Dissertation, Berlin, June 1889.

Practical Aspects of the Alternating Current Theory, Transactions of the American Institute of Electrical Engineers, Vol. VII, Dec. 1889, p. 204 (Boston, May 21, 1890)

- The Characteristic Features of the Frankfurt Electrical Exhibition. School of Mines Quarterly, Nov., 1891.
- On Polyphasal Generators, Transactions of the American Institute of Electrical Engineers, Vol. VIII, Dec. 1891, p. 562. (New York, Dec. 16, 1891)
- On the Action of Vacuum Discharge Streamers Upon Each Other, American Journal of Science, April 1892, Vol. 43, 256.
- On Electrical Discharges through Poor Vacua and on Coronoidal Discharges, American Journal of Science, June 1892, Vol. 43, 258. (Read before the National Academy of Sciences, Wash., April 23, 1892)
- On Electrical Oscillations of Low Frequency and Their Resonance, American Journal of Science, April 1893, Vol. 45, 325.
- Tesla's High Frequency Phenomena, Physical Review, Oct. 15, 1893.
- Practical Aspects of Low Frequency Electrical Resonance, Transactions of the American Institute of Electrical Engineers, Vol. X, 1893, p. 370. (New York, May 17, 1893)
- Resonance Analysis of Alternating and Polyphase Currents, Transactions of the American Institute of Electrical Engineers, Vol. XI, Oct., 1894, p. 523. Also American Journal of Science, Nov. 1894.
- System of Resonating Conductors for Telegraphy and Telephony. Electrical Engineer, May, 1894.
- Submarine Rapid Telegraphy and Telephony. Electrical World, May, 19, 1894.
- Electrical Consonance. Electrical World, Feb. 9, 1895.
- Les Oscillations Electrique. H. Poincare (Review) Science, Jan. and Feb. 1895.
- Tendencies of Modern Electrical Research. Address delivered before the New York Academy of Sciences, April 28, 1895. Science, Vol. II, No. 52, Dec., 1895.
- Studies in the Electro-magnetic Theory, American Journal of Science, Oct. 1895.
- An Automatic Mercury Vacuum Pump, American Journal of Science, Jan. 1895.
- Diffuse Reflection of Roentgen Rays (Science, April, 1896), announcing Pupin's discovery of secondary x-ray radiation.
- Roentgen Rays, Science, March 20, 1896. (N.Y. Academy of Sciences) March 2, 1896.
- Magnetic Circuits, Science, Jan. 24, 1896. (N.Y. Academy of Sciences)
- Propagation of Long Electrical Waves, Transactions of the American Institute of Electrical Engineers, Vol. XVI, 1899, p. 93. (New York, March 22, 1899)
- A Faradmeter, Transactions of the American Institute of Electrical Engineers, Vol. XVII, 1900, p. 75. (New York, Feb. 28, 1900)

- Wave Propagation over Non-Uniform Electrical Conductors, Transactions of the American Mathematical Society, July, 1900, Vol. 1, 259-286.
- Wave Transmission over non-Uniform Cables and Long-Distance Air-Lines, Vol. XVII. Transactions of the American Institute of Electrical Engineers, Vol. XVII, 1900, p. 445 (May 19, 1900)
- Electrolytic Rectifier of Alternating Currents. Bulletin of the American Physical Society, Vol. I, p. 20
- A Note on Loaded Conductors. Electrical World and Engineer, Oct. 12, 1901.
- The General Problem of Wave Propagation over Non-Uniform Conductors. Electrical World and Engineer, March 1, 1902.
- Establishment of the Steady State in a Sectional Wave Conductor, Bulletin of the American Mathematical Society, Feb. 1906. (Paper read at meeting, Dec. 28, 1905.
- The Debt We Owe to Henry as a Scientist, Transactions of the American Institute of Electrical Engineers, Vol. XXXI, 1912, p. 1019. (New York, May 21, 1912)
- The Aerial Transmission Problems, Science, Dec. 10. 1915.
- From Chaos to Cosmos, Scribners Magazine, July, 1924. (Gibbs Lecture)
- The Meaning of Scientific Research, Science, Jan. 9, 1925. (Lecture delivered before the Sigma Xi Club of New York University, Tuesday, Nov. 25, 1924)
- Chandler: The Teacher and The Chemist, Science, Dec. 4, 1925. (Address delivered at a Memorial Meeting, Nov. 16, 1925, in honor of the late Charles Frederick Chandler)
- Law, Description and Hypothesis in the Electrical Science, Science, July 10, 1925. (The first Steinmetz lecture delivered on May 8, 1925, before the Schenectady Section of the American Institute of Electrical Engineers)
- The Cosmic Harness of Moving Electricity, Transactions of the American Institute of Electrical Engineers, Vol. XLV, 1926, p. 806. (White Sulphur Springs, W. Va., June 22, 1926. President's address)
- Fifty Years' Progress in Electrical Communications, Science, Dec. 31, 1926. (Address of the retiring president of the American Association for the Advancement of Science, Philadelphia, Dec. 27, 1926)
- Higher Endeavor in Science, Science, May 27, 1927. (Address on the laying of the corner stones of an engineering building and a chemical laboratory at Princeton Univ., on May 12, 1927)
- Thomson's Elements of the Mathematical Theory of Electricity and Magnetism, Physical Review, 3, 393.
- Thermodynamics of Reversible Cycles, Physical Review, 2, 239.
- Balancing Cables by Inductive Networks, Electrical Engineering, Vol. 50, Dec. 1931, p. 933.
- The Equation of Electrical Propagation, Electrical Engineering, Vol. 53, May 1934 (Fiftieth Anniversary Issue) p. 691.
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