

PUPIN, MICHAEL IDVORSKY (*b.* Idvor, Banat [now Yugoslavia], 4 October 1858; *d.* New York, N.Y., 12 March 1935), *applied physics*.

Pupin was born to a family of unlettered Serbian settlers in the Banat, a military buffer zone between the Ottoman and Austro-Hungarian empires. Because of his obvious gifts, his parents were encouraged to let him complete his secondary studies at a larger center. He was thus sent to Prague, where he stayed for more than a year; but before he was sixteen, he went alone to America, arriving in New York in 1874. During the next five years he worked at odd jobs on farms and in factories, studying at night to prepare himself for admission to Columbia University on a scholarship, an ambition he fulfilled in 1879.

Pupin graduated with distinction in 1883 and after additional study at the University of Cambridge went to Berlin, where he worked under Helmholtz and G. Kirchhoff, receiving the doctorate in 1889 with a dissertation on osmotic pressure. He then returned to Columbia to teach mathematical physics in the newly formed department of electrical engineering. He advanced rapidly and in 1901 was made professor of electromechanics, a post he occupied until his retirement in 1931.

During his studies of the distortions that arise when iron is magnetized by an alternating current, Pupin developed electrical resonators (by analogy with resonators used to study complex sound waves) that proved to be applicable to problems in telegraphy and telephony. His most important contribution grew out of a study of the electrical analogue of a vibrating string "loaded" at regular intervals. This work not only confirmed that the periodic insertion of inductance coils in telephone lines would improve their performance by reducing attenuation and distortion, but it also allowed him to calculate optimum coil size and spacing, an invention of considerable practical and commercial value. For a time such lines were called "pupinized."

Pupin also made many other contributions of an applied nature, for instance, in X-ray fluoroscopy, design of early radio transmitters, and electrical network theory. He was a popular and outstanding teacher. Among his pupils were several of the pioneers of radio communications, the most notable of whom was E. H. Armstrong. Pupin also became prominent in public affairs and was an adviser to the Yugoslav delegation to the Paris Peace Conference in 1919. He was an accomplished writer; and his best-selling autobiography, *From Immigrant to Inventor*, received the Pulitzer Prize in 1924. He received many honors, including eighteen honorary degrees, and was elected to the National Academy of Sciences. The physics

laboratory at Columbia University is named in his honor.

In 1888 Pupin married a young widow, Sarah Katherine Jackson; she died in 1896. The couple had one daughter, Varvara.

BIBLIOGRAPHY

Pupin's publications follow his entries in Poggendorff, VI, 2094; and *Biographical Memoirs. National Academy of Sciences*, 19 (1938), 307–323. The latter (by Bergen Davis) also lists his many honors and thirty-four patents. Other biographical entries include *National Cyclopaedia of American Biography*, XXVI (1937), 5–6; and *Dictionary of American Biography*, XXI, supp. 1 (1944), 611–615.

CHARLES SÜSSKIND

PURKYNĚ (PURKINJE), JAN EVANGELISTA (*b.* Libochovice, Bohemia [now Czechoslovakia], 17 December 1787; *d.* Prague, Bohemia, 28 July 1869), *physiology, histology, embryology, education*.

Purkyně's name (usually spelled Purkinje, a form he adopted so as to have it pronounced correctly by German speakers) is known today in the eponyms Purkyně cells (in the cerebellum), Purkyně fibers (of the heart), Purkyně (or Purkyně-Sanson) images, Purkyně's phenomenon (shift in the relative apparent brightness of red and blue in dim light), and Purkyně's tree (the shadows of the retinal vessels). He was a versatile scholar with wide-ranging interests and an exceptional ability to observe, mainly subjective sensory phenomena and minute morphological structures. After 1850 Purkyně was concerned mainly with the role that knowledge and science should play in the life of his nation.

Purkyně's father was manager of an estate of Prince Dietrichstein in northern Bohemia. He stimulated interest in and knowledge of nature in his eldest son, although he died when Jan was only six. The local schoolteacher and parson helped the talented boy, who at the age of ten was admitted as a choirboy to a Piarist monastery on another of the Dietrichstein estates, at Mikulov (Nikolsburg) in southern Moravia, near the Austrian border. Initially handicapped because he knew only Czech, Purkyně soon learned both languages of instruction, German and Latin, and became one of the best students.

When he had completed his secondary education, Purkyně took orders and, after a year of novitiate, began teaching in a Piarist school at Strážnice, Moravia. In 1806 he was sent to Litomyšl in eastern Bohemia to continue his education at the Piarist Philosophical Institute, the obligatory preparation