Electrical Engineering Hall of Fame

ALBERT H. TAYLOR

In 1942, the Institute of Radio Engineers (IRE) awarded its Medal of Honor to Albert H. Taylor (Fig. 1). He was cited "for his contributions to radio communication as an engineer and organizer, including pioneering work in the practical application of piezoelectric control to radio transmitters." The citation also mentioned his "early recognition and investigation of skip distances and other high-frequency wave propagation problems, and many years of service to the government of the United States as an engineering executive of outstanding ability in directing the Radio Division of the Naval Research Laboratory." He is remembered especially as a leading contributor to the development of early radar systems. He served as president of the IRE in 1929.

Albert Hoyt Taylor was born 1 January 1879 in Chicago, IL, and graduated with a degree in physics from Northwestern University in 1902. He undertook his first research on radio communication while still an undergraduate, which led to his first published paper in 1902. He taught physics at the University of Wisconsin from 1903 to 1908. He received a PhD degree from the University of Göttingen in Germany in 1909 with a thesis on aluminum rectifiers. Taylor then accepted a position as head of the department of physics at the University of North Dakota where he remained until 1917. While there, he engaged in research on directive antennas and the propagation of radio waves. He coauthored an IRE paper published in April 1916 on "Variations in Nocturnal Transmission."

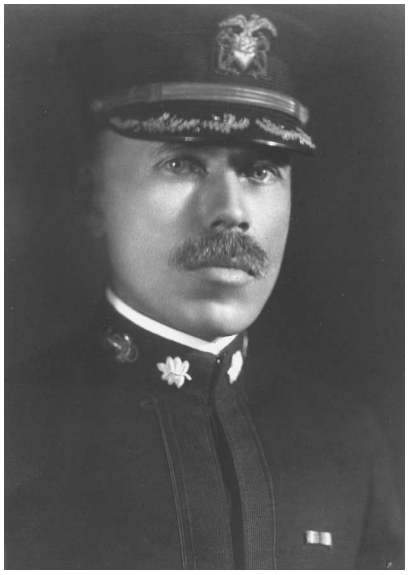

Fig. 1. *Albert H. Taylor (IEEE History Center).*

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I. CONCEALED ANTENNAS AND AIRBORNE RADIOTELEPHONY

In 1917, Taylor accepted a commission in the U.S. Naval Reserve and was appointed District Communication Officer at the Great Lakes Naval Station in Chicago. He directed an investigation of underground and underwater antennas suitable for low frequency radio communication. Several years later, in June 1919, he published an IRE paper based on this research with the title "The Possibilities of Concealed Receiving Systems." In the paper, he reported that good reception could be obtained without using a conventional antenna. He mentioned that he had received signals from the Navy transmitter in Arlington, VA, and several other stations located hundreds of miles away using a receiving antenna consisting of a rectangular loop with many turns of wire. He pointed out that this type of antenna could easily be concealed behind a curtain or inside the wall of a building if desirable for military or other reasons.

In October 1917, Taylor was transferred to Belmar, NJ, to become communication officer in charge of a network of low-frequency, high-power stations situated along the East coast and used in transatlantic communication. The network included transmitters at New Brunswick, NJ, Tuckerton, NJ, and Sayville on Long Island, NY.

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Receiving stations were located in Belmar, NJ, Chatham, MA, and Bar Harbor, ME. The network enabled direct communication between the U.S. and military forces in Europe during the War.

In July 1918, Taylor was chosen to direct a research program on radio communication with aircraft at the Naval Air Station in Hampton Roads, VA. The General Electric Company (GE) supplied several experimental vacuum-tube radio sets for use with seaplanes. One of the GE transmitters produced a maximum of about 500 W for radio telegraphic communication or 250 W for voice and provided a maximum range of about 600 nmi. A special helmet with a built-in phone was developed for use with the equipment. The Navy also tested a vacuum-tube transmitter developed by the Western Electric Company. The introduction of airborne radiotelephony proved to be one of the most important technical innovations of the first World War. It enabled centralized command and control of voice-commanded squadrons of aircraft as well as individual search planes.

II. DIRECTOR OF THE RADIO DIVISION OF NRL

Soon after the War ended, Taylor became the director of a Navy Radio Laboratory to be established at Anacostia, DC. Pending completion of the facility, he and his staff of fifteen people were stationed temporarily at the National Bureau of Standards in Washington, DC. Taylor authored an IRE paper on short-wave reception published in August 1919 and another on long-wave reception and the "elimination of strays" published in December 1919. He was elected a Fellow of the IRE in 1920. He ended his active duty career in 1922 but remained at Anacostia as a civilian employee. The formal commissioning ceremony of the Naval Research Laboratory (NRL) was held in July 1923. At the time, the NRL had two technical divisions: the Radio Division headed by Taylor and the Sound Division headed by Harvey C. Hayes.

During the summer of 1922, Taylor and a colleague, Leo C. Young, conducted high-frequency communication experiments using a fixed transmitter and a portable receiver. They discovered that a ship passing by on the Potomac River produced fluctuations in the received signals. Taylor wrote an internal memorandum proposing the development of a radio ship detector but received no authorization to pursue this line of research until several years later. However, Taylor and his assistants continued to collect data on short-wave propagation over a wide range of frequencies and distances to serve as the basis of new communication systems. He disclosed some of the results of this effort in an IRE paper entitled "An Investigation of Transmission on the Higher Radio Frequencies" published in December 1925. He included data on reception at various distances over a frequency range from 100 kHz to 20 MHz. He mentioned that a 1 kW transmitter operating at a wavelength of about 20 m had provided better communication between the United Sates and Panama than obtained by a

Fig. 2. *Arthur E. Kennelly (IEEE History Center).*

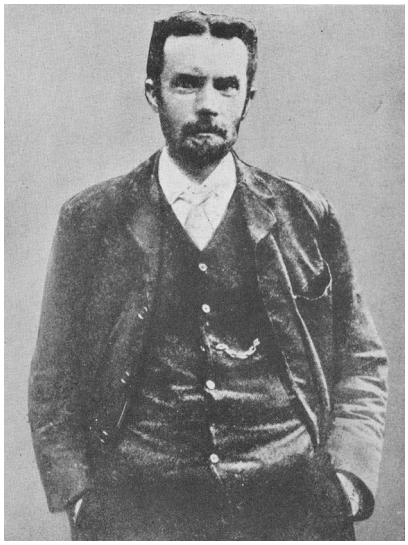

Fig. 3. *Oliver Heaviside (IEEE History Center).*

500 kW transmitter at a wavelength of 17 km.

III. RECIPIENT OF MORRIS N. LIEBMANN MEMORIAL AWARD

Taylor's team also investigated ionospheric effects on communication. He authored an IRE paper published in August 1926 on the "Relation between the Height of the Kennelly-Heaviside Layer and High-Frequency Radio Transmission Phenomena" (Figs. 2 and 3). He suggested that shorter wavelengths could be used for long-distance communication than generally believed. Methods of echo sounding using short-wave pulses developed during this research on the ionosphere later were adapted to the development of radar systems. The IRE awarded Taylor the Morris N. Liebmann Memorial Award in 1927 "for his work in connection with the investigation of radio transmission phenomena."

IV. DEVELOPMENT OF EARLY RADAR

During the 1930s, Taylor and his colleagues, including Leo C. Young, Lawrence A. Hyland, and Robert M. Page, played a pioneering role in the development of what became known as radar. In June 1930, while

conducting tests of using high-frequency radio beams to facilitate the landing of airplanes, Hyland and Young observed reflections from nearby planes. Further experiments led the NRL group to shift from using continuous waves to pulses, and they initiated development of an experimental radar set using short pulses at 60 MHz in 1934. The project evolved into a 200 MHz radar which demonstrated aircraft detection at ranges up to 60 miles by early in 1938. This served as a prototype for the so-called CXAM radar which was installed on approximately 20 Navy ships by December 1941.

Taylor retired from the NRL in 1948. He died 11 December 1961 at age 82 and is buried at the Arlington National Cemetery. ■

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