obituary

Harry Nyquist, widely known for his theoretical studies and practical inventions in the field of communications, died on April 4 at the age of 87 in Harlingen, Texas. Born in Nilsby, Sweden, on February 7, 1889, Nyquist was the son of Lars and Katarina Nykvist. He emigrated to Minnesota in 1907 and taught at the Southern Minnesota Normal School in Austin, Minnesota. Nyquist earned his BA, BS and MS degrees from the University of North Dakota, and in the summers worked at the National Bureau of Standards and the US Patent Office.

He joined the American Telephone and Telegraph Company in 1917, shortly after he had obtained his PhD in physics from Yale University, and moved to the Bell Telephone Laboratories in 1934.

From 1917 to 1921 he worked primarily on the development of the metallic telegraph system and methods of measuring telegraph distortion. From 1921 to 1935 he devoted considerable time investigating television techniques, and worked on projects aimed at extending and improving long-distance telephone circuits.

After 1935, Nyquist devoted most of his time to research work where he applied his broad knowledge and analytical ability to the most difficult of challenges in the field of communications development. For the two years before his retirement in 1954 he was Bell Laboratories' Assistant Director of Systems Studies.

Nyquist was awarded 138 patents during his 37 years with the Bell System. Many of his inventions and theories are widely accepted as fundamental to voice, picture and data transmission. His discovery of the conditions necessary to keep feedback circuits stable, the 'Nyquist Criterion', brought him widespread acclaim. It is used not only in the study of electronic devices, such as amplifiers, but even in the study of human regulating processes—for example, to describe the way in which a person steers a car.

He gave the first quantitative explanation of thermal noise, and through theoretical analysis determined the minimum band of frequencies required to transmit various kinds of communication signals. These studies laid the foundation for modern information theory and data transmission. In the television field, Nyquist invented a method of transmission used in broadcasting today, and also discovered a way to correct delay distortion of TV images.

Among the many honours Nyquist received were: the Mervin J. Kelly Award of the AIEE (1961), the National Academy of Engineering founders Medal (1969) and the Rufus Oldenburger Medal from the ASME (1975).

Harald Trap Friis, a pioneer in the development of radio communications and an initiator of microwave radio transmission and radio astronomy, died on June 15. He was 83 years old.

Friis was born in Naestved, Denmark, February 22, 1893. He attended the Royal Technical College in Copenhagen, where he received his Electrical Engineering degree in 1916 and his Doctorate in Science in 1938. From 1917 to 1918 he worked as Technical Advisor at the Royal Gun Factory in Copenhagen. In 1919, upon receipt of a Fellowship from the American-Scandinavian Foundation, he moved to the United States to study at Columbia University.

In 1920 Friis joined the Western Electric Company's research department, the predecessor organisation to Bell Laboratories, and in the twenties he designed the first commercial 'double - detection super - heterodyne broadcast radio receiver', the forerunner of present-day radios. In 1923, Friis spent several months in England devising receivers for a long-wave transatlantic telephone link. In the decade that followed he is credited with designing a receiver that automatically compensated for fading signals, an improved directional antenna, and methods for recording static and measuring fading shortwave signals.

His most famous achievement was, however, in the design of antennae. One designed by Friis together with Bell Labs colleague, Karl Jansky, was the first to detect 'star noise' in 1932—the birth of radio astronomy. The rhombic antenna designed by Friis and another colleague, Edmond Bruce, found worldwide use in shortwave radio telephony, and yet another of his antennae—the Multiple Unit Steerable Antenna—made it possible, Friis said, "to unravel the phenomena of shortwave transmissions". He was the co-author of the book *Antennas: Theory and Practice* (1952).

In 1938 Friis moved from shortwaves to microwaves and created the horn-reflector antenna, now seen on tower tops all over the country. During this period Friis put together the basic elements of a microwave telephone system. A year after the end of the war, the first experimental microwave circuits based on Friis' designs were installed for domestic use and today, Bell System microwave radio facilities provide some 380 million miles of long distance telephone circuits.

Following his retirement, Friis spent 10 years as a research consultant to the Hewlett-Packard company in Palo Alto, California. He published an autobiography, *Seventy Five Years in an Exciting World* in 1971.

announcements

Meetings

September 9–10, **565th Meeting of the Biochemical Society,** Stirling (The Meetings Officer, The Biochemical Society, 7 Warwick Court, Holborn, London WC1R 5DP).

September 15–17, **Herbicides and Fungicides, Factors Affecting Their Activity,** Bangor, Wales (Dr S. Turner, Reckitt and Colman Pharmaceutical Division, Dansom Lane, Hull HU8 7DS).

October 11–13, **Transportation and Communications,** Genoa (Segretaria Generale IIC, Villa Piaggio, Via Pertinace-16125 Genova, Italy).

October 22, **Human and Animal Endoparasites,** London (The Assistant Secretary, Society of Chemical Industry, 14 Belgrave Square, London SW1X 8PS).

November 15–26, **Weather Forecasting in Africa,** Dakar, Senegal (The Secretariat, WMO, Geneva, Switzerland).

November 19, **The Newer Applications of Pyrethroids,** London (The Assistant Secretary, Society of Chemical Industry, 14 Belgrave Square, London SW1X 8PS).

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