

Harald T. Friis Papers
A Finding Aid to the Collection in the Library of Congress



Manuscript Division, Library of Congress
Washington, D.C.
2014

Contact information: <http://hdl.loc.gov/loc.mss/mss.contact>

Catalog Record: <https://lcn.loc.gov/mm81075865>

Additional search options available at: <https://hdl.loc.gov/loc.mss/eadmss.ms014021>

Prepared by Manuscript Division Staff

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Collection Summary

Title: Harald T. Friis Papers

Span Dates: 1921-1976

ID No.: MSS75865

Creator: Friis, Harald T. (Harald Trap), 1893-1976

Extent: 600 items

Extent: 8 containers

Extent: 5 linear feet

Language: Collection material in English and Danish

Location: Manuscript Division, Library of Congress, Washington, D.C.

LC Catalog record: <https://lcn.loc.gov/mm81075865>

Summary: Radio engineer and inventor. Correspondence and other papers relating to Friis's work on radio transmission, radio astronomy, and microwaves.

Selected Search Terms

The following terms have been used to index the description of this collection in the LC Catalog. They are grouped by name of person or organization, by subject or location, and by occupation and listed alphabetically.

People

Friis, Harald T. (Harald Trap), 1893-1976.

Friis, Harald T. (Harald Trap), 1893-1976. Seventy-five years in an exciting world.

Organizations

Bell Telephone Laboratories.

Subjects

Antennas (Electronics)

Microwaves.

Radio astronomy.

Radio noise.

Radio--Antennas.

Radio--Equipment and supplies.

Radio--Patents.

Radio--Transmitters and transmission.

Radio.

Occupations

Inventors.

Radio engineers.

Provenance

The papers of Harald T. Friis, radio engineer and inventor, were given to the Library of Congress by Mrs. Harald T. Friis in 1977.

Processing History

The Friis Papers were processed in 1981. The finding aid was revised in 2014.

Copyright Status

The status of copyright in the unpublished writings of Harald T. Friis is governed by the Copyright Law of the United States (Title 17, U.S.C.).

Access and Restrictions

The papers of Harald T. Friis are open to research. Researchers are advised to contact the Manuscript Reading Room prior to visiting. Many collections are stored off-site and advance notice is needed to retrieve these items for research use.

Preferred Citation

Researchers wishing to cite this collection should include the following information: Container number, Harald T. Friis Papers, Manuscript Division, Library of Congress, Washington, D.C.

Biographical Note

| Date | Event |
|-----------------|---|
| 1893 | Born, Naestved, Denmark |
| 1916 | Graduated in electrical engineering, Royal Technical College, Copenhagen, Denmark, and started working at Royal Gun Factory |
| 1919 | Studied radio engineering, Columbia University, New York, N.Y. |
| 1920-1958 | Employed with research group at Western Electric Co., which became part of Bell Telephone Laboratories in 1925 |
| 1923-1928 | Published IRE (Institute of Radio Engineers) papers on radio signal to noise ratio, directional antennas, and oscillographic observations |
| 1930s | Developed with colleague Karl Jansky a new science of radio astronomy by assisting in the design of receiving system; co-invented with Edmond Bruce rhombic antenna for shortwave radio |
| 1938 | Appointed director, research team at Homdel Laboratory of Bell Labs |
| 1940s | Research group under his direction developed microwave radar and microwave communication equipment |
| 1946 | Published formula for transmission loss, the Friis transmission equation |
| 1954 | Recipient, Valdemar Poulsen Medal of the Danish Academy of Sciences |
| 1955 | Recipient, IRE Medal of Honor (now the IEEE Medal of Honor) |
| 1958 | Recipient, Ballentine Medal from the Franklin Institute |
| 1958 | Retired from Bell Labs |
| 1958-circa 1968 | Research consultant, Hewlett-Packard Co. |
| 1971 | Published <i>Seventy Five Years in an Exciting World</i> . San Francisco: San Francisco Press |
| 1976, June 15 | Died, Palo Alto, Calif. |

Scope and Content Note

The papers of Harald Trap Friis (1893-1976) span the years 1921-1976. The papers are in English and Danish and are organized alphabetically by type of material and by subject matter with a miscellany at the end composed of awards, photographs, scrapbooks and printed matter.

After studying in Denmark and at Columbia University, Friis spent his career at Bell Telephone Laboratories as a researcher in various aspects of radio engineering. The papers relate to his work in radio transmission, signal to noise ratio, radio astronomy, antennas, and microwave transmission and equipment. Included are correspondence, notes, diagrams, patents, writings, scrapbooks, printed matter, photographs, and material for the writing of his 1971 memoir *Seventy-Five Years in*

an Exciting World. The photograph album from Bell Telephone Laboratories covers his long career with that company. Photographs document radio equipment, antenna designs including large antennas for radio astronomy, his co-workers, and the Holmdel laboratory facility.

Arrangement of the Papers

This collection is arranged alphabetically by type of material and subject matter.

Container List

| Container | Contents |
|-----------|---|
| BOX 1 | Notes, 1943-1970 (12 folders) |
| BOX 2 | Subject file |
| BOX 2 | Amplifier, 1954 |
| BOX 2 | Antenna towers, 1956-1957 |
| BOX 2 | Antenna sputnik radar, 1956-1965 |
| BOX 2 | Boonton Radio Corp., 1960-1962 |
| BOX 2 | Clogston cable, 1950 |
| BOX 2 | Dielectric antennas, 1951-1957 |
| BOX 2 | Edison Medal, 1974 |
| BOX 2 | Frequency converter, 1959-1968 |
| BOX 2 | Frequency modulation diversity FM feedback phase set, 1953-1963 |
| BOX 2 | Friis Fellowship, Stanford University, Stanford, Calif., 1976 |
| BOX 2 | Gaussian, Rayleigh 1956-1957 |
| BOX 3 | Jansky, Karl, 1928-1933 |
| BOX 3 | Laboratory, 1956-1957 |
| BOX 3 | Masers, varicaps, 1959-1960 |
| BOX 3 | Noise figures, 1942-1944, 1957-1959 |
| BOX 3 | Nonlinear circuits, 1951-1954, 1957-1963 |
| BOX 3 | Old antenna, 1924-1939 |
| BOX 3 | Oswald, A. A., 1937 |
| BOX 3 | Patents, 1926-1963 |
| BOX 3 | Propagation, 1950-1959 |
| BOX 3 | Special circuits, 1960 |
| BOX 3 | Timing pulses, 1955 |
| BOX 3 | Transmission formula, 1936, 1946, 1971 |
| BOX 3 | Transistors, 1958-1963 |
| BOX 3 | Tuning, 1944 |
| BOX 3 | Waveguides, 1946-1959 |
| BOX 3 | Waveguides and transmission lines, 1940-1959 |
| BOX 3 | Wheeler Laboratories, 1959-1961 |
| BOX 4 | Writings |
| BOX 4 | Hewlett-Packard Co. book, 1971-1974, undated (2 folders) |
| BOX 4 | Noise, 1924, 1928 |
| BOX 4 | Reprints, 1946-1971 |
| BOX 4 | Research, 1950, 1957 |
| BOX 4 | <i>Seventy-Five Years in an Exciting World</i> |
| BOX 4 | Correspondence, 1954-1979 (4 folders) |
| BOX 4 | Illustrations and photographs, 1930-1969, undated |

Container List

| Container | Contents |
|------------------|--|
| BOX 4 | Research and old writings file, 1921-1960 (2 folders) |
| BOX 4 | Thirty Years with microwave, 1968-1969 |
| BOX 5 | Miscellany |
| BOX 5 | Awards and certificates |
| BOX 6 | Scrapbooks |
| BOX 6 | Photograph album, Bell Telephone Laboratories, circa 1925-1957 |
| BOX 7 | Printed matter |
| BOX 8 | Printed matter |