



Smithsonian

National Museum of American History Kenneth E. Behring Center

Guide to the Harold Lyons Atomic Clocks collection

NMAH.AC.0701

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2007

Archives Center, National Museum of American History

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Collection Overview

Repository:	Archives Center, National Museum of American History
Title:	Harold Lyons Atomic Clocks Collection
Date:	1935 - 1991
Identifier:	NMAH.AC.0701
Creator:	Lyons, Harold, Dr., 1913-1998 (Author) Lyons, Sherrie (Donor)
Extent:	2 Cubic feet (6 boxes)
Language:	English .
Summary:	Harold Lyons was a physicist whose primary interest was in atomic frequency standards and atomic clocks. The collection documents Lyons and his work with atomic clocks. The collection includes his research as manifested in published papers, presentations, reports, correspondence, laboratory notes, photographs and diagrams.

Administrative Information

Acquisition Information

The collection was donated by Harold Lyons's daughter, Sherrie L. Lyons, in January, 2000.

Related Materials

Materials in the Archives Center

National Company (NATCO) Atomic Clocks Records, 1955-1968 (AC0547), contains related archival materials, principally on the development of the first commercial atomic clock, the Atomichron.

Materials in the National Museum of American History

The Division of Work and Industry, formerly the Division of Information, Technology and Communication, holds the first operative atomic clock, constructed under Lyons's direction at the National Bureau of Standards in 1948.

Processing Information

Processed by Jeanne Sklar (intern) August 2001; supervised by Alison Oswald, archivist.

Preferred Citation

Harold Lyons Atomic Clocks Collection, Archives Center, National Museum of American History, Smithsonian Institution.

Restrictions

The collection is open for research use.

Conditions Governing Use

Collection items available for reproduction, but the Archives Center makes no guarantees concerning intellectual property rights. Archives Center cost-recovery and use fees may apply when requesting reproductions.

Biographical / Historical

Harold Lyons was born February 16, 1913 in Buffalo, New York, and attended the University of Buffalo, graduating summa cum laude with a B.S. in Physics in 1933. After obtaining a Ph.D. in Nuclear Physics from the University of Michigan in 1939, he worked at the Naval Research Laboratories for two years and then joined the National Bureau of Standards (NBS) in 1941. In 1944, he was appointed chief of the Microwave Standards Section of an Interservice Radio Propagation Laboratory (IRPL) established at the NBS during World War II. He continued in that position after the war when the IRPL, in 1946, was reconstituted as the Central Radio Propagation Laboratory (CRPL).

Lyons's work on microwave frequency standards led directly to his interest in atomic frequency standards and atomic clocks. On his initiative a substantial program of research and development was pursued in the Microwave Standards Section from 1948-1951. There under his direction the first operative atomic clock, based on the absorption of microwaves of ammonia, was constructed in 1948 and announced in early 1949.

Lyons remained with the CRPL after it was moved to Boulder, Colorado, in 1954, but left a year later to work in Hughes Aircraft Company's Culver City, California, research labs. Here he continued his atomic physics research, particularly applications for the atomic clock, including satellite technology, and expanding to development work in lasers. He continued his work on lasers at Electro-Optical Systems Quantum Physics Division from 1960-1962. In the late 1960s and during the 1970s, he was an independent physics consultant and conducted research through an association with the University of California, Los Angeles.

Harold Lyons died March 23, 1998 in Los Angeles, California.

Scope and Contents

The Harold Lyons Papers, 1935-1991, show his professional interests, especially his research from the 1950s, as manifested in published papers, presentations, reports, correspondence, laboratory results, and photographs. The bulk of the collection consists of papers and presentations of Lyons and others in the atomic physics field. Most of Lyons's work and the materials he collected address different aspects of microwave frequency.

Formats represented in the collection include published articles, typewritten and handwritten manuscripts, typewritten and handwritten personal correspondence, memorandums, photographs, diagrams, laboratory results, pamphlets, and newspaper clippings. The collection is arranged into five series.

Series 1, Biographical Information, 1955-1965; 1973, contains copies of Lyons's curriculum vitae (circa 1955, 1962, and 1971) and his entries in *Who's Who in America* and *Who's Who in The West*. This series also has two folders with materials relating to two honors he received, the Franklin Institute Certificate of Merit, in 1958, and the U.S. Department of Commerce's 25th Commemorative Award in 1973.

Series 2, Papers and Presentations, 1947-1962; 1973-1974, contains the journal articles and papers authored by Lyons and the conference and special presentations he gave during his career, most of which address research for aspects of the atomic clock. Included are papers he authored published in the *Journal of Applied Physics*, *American Scholar*, *Scientific American*, and *Annals of the New York Academy of Sciences* and presentations given at the National Bureau of Standards for the anniversary of the atomic clock.

Series 3, Correspondence, 1949-1991, contains general correspondence for the years 1949-1966, 1978, 1987, and 1991, as well as correspondence with the following individuals: Dirk Brouwer, Paul Forman,

Polykarp Kusch, Koichi Shimoda, Wilbert F. Snyder, Charles H. Townes, and Jerrold R. Zacharias. The bulk of this series is incoming correspondence addressed to Lyons, although he did retain some copies of outgoing correspondence.

Series 4, Research, 1947-1958; 1970-1991, contains laboratory results for deuterated ammonia (via strip chart recordings) and general cesium atomic beam experiments through calibration of magnetic fields, calculation of c-fields in the magnetic chamber, and atomic beam measurements. It also contains brief information on other research interests, such as the International Scientific Radio Union, and scattered promotional materials for natural health and electrical products. In addition, this series contains a copy of the patent granted to Lyons and Benjamin F. Husten in 1955 for the atomic clock and photographs and diagrams relating to Lyons's work on the atomic clock. Included are black and white photographs of Lyons and his colleagues with views of the clock as well as diagrams and charts included in published and unpublished work and presentations. Most of the photographs and diagrams are undated and unlabeled.

Series 5, Collected Background Research Materials, 1935-1982, contains papers and presentation materials focused on atomic physics, including papers published in journals, memoranda, technical reports, conference programs, and conference proceedings. One folder in this series has materials relating to the promotion of the atomic clock through pamphlets, speeches, papers, and one oversize item of reproduced newspaper clippings. A folder relating to a university course of lectures, most likely authored by Polykarp Kusch of Columbia University, on molecular beams is also included in this series. In addition, this series contains copies of two patents, one granted to Friedrich H. Reder in 1960 for molecular resonance devices, and the other, an Australian patent, applied for in 1958, for an invention dealing with a frequency selective method and system.

Arrangement

The collection is organized into five series.

Series 1, Biographical Information, 1955-1965; 1973

Series 2, Papers and Presentations, 1947-1962; 1973-1974

Subseries 1, Publications, 1947-1948; 1950-1953; 1957; 1959-1960; 1962; undated

Subseries 2, Presentations, 1946-1958; 1973-1974

Series 3, Correspondence, 1949-1991

Series 4, Research, 1947-1958; 1970-1991

Subseries 1, Laboratory Findings, 1952-1954; undated

Subseries 2, Other Research Interests, 1947-1957; 1970-1991

Subseries 3, Photographs and Diagrams, 1957; undated

Series 5, Collected Background Research Materials, 1935-1982

Names and Subject Terms

This collection is indexed in the online catalog of the Smithsonian Institution under the following terms:

Subjects:

- Atomic absorption spectroscopy
- Atomic clocks
- Atomic frequency standards
- Physics
- Time -- Systems and standards

Types of Materials:

Articles -- 20th century

Correspondence -- 1940-2000

Diagrams

Laboratory notebooks

Patents

Photographs -- Black-and-white photoprints -- Silver gelatin -- 1950-1960

Technical notes

Container Listing

Series 1: Biographical Information , 1973, 1955 - 1965

Box 1, Folder 1 Curriculum vitae and biographical data , 1955 - 1965

Box 1, Folder 2 Franklin Institute Certificate of Merit , 1958

Box 1, Folder 3 [U.S. Department of Commerce 25th Commemorative Award, 1973](#)

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Series 2: Papers and Presentations, 1973 - 1974, 1947 - 1962

Subseries 2.1: Publications , 1950 - 1953, 1947 - 1948, 1959 - 1960, 1957, 1962, undated

Box 1, Folder 4	"Cesium, Atomic Beam Frequency Standard" , undated
Box 1, Folder 5	The Microwave Frequency Standard at the Central Radio Propagation Laboratory, 1947
Box 1, Folder 6	"Microwave Frequency Measurements and Standards" , 1948
Box 1, Folder 7	"Microwave Frequency Dividers" , 1950
Box 1, Folder 8	"The Atomic Clock, A Universal Standard of Frequency and Time" , 1950
Box 1, Folder 9	"Microwave Measurement of the Dielectric Properties of Gases" , 1950 - 1951
Box 1, Folder 10	"Spectral Lines as Frequency Standards" , 1952
Box 1, Folder 11	"Microwave Absorption Spectrum of ND ₃ " , 1953
Box 1, Folder 12	"Atomic Clocks" , 1957
Box 1, Folder 13	"Amazing Maser" and "Maser, Iraser, and Laser" , 1960, 1959
Box 1, Folder 14	"Molecular Beam Devices", 1962

Subseries 2.2: Presentations, 1973 - 1974, 1946 - 1958

Box 1, Folder 15	Presentations , 1946 - 1958
Box 1, Folder 16-17	National Bureau of Standards , 1973

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Series 3: Correspondence , 1949 - 1991

Box 2, Folder 1-2	General correspondence , 1949 - 1991
Box 2, Folder 3	Dirk Brouwer , 1951 - 1955
Box 2, Folder 4-5	Paul Forman, Smithsonian , 1982 - 1985, 1990
Box 2, Folder 6	Polykarp Kusch , 1949 - 1956
Box 2, Folder 7	Koichi Shimoda , 1955 - 1957
Box 2, Folder 8-11	Wilbert F. Snyder , 1978, 1987, 1950 - 1966
Box 2, Folder 12	Charles H. Townes, 1954 - 1955
Box 2, Folder 13	Jerrold R. Zacharias, 1952 - 1953

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Series 4: Research, 1947 - 1958, 1970 - 1991

Subseries 4.1: Laboratory Findings , 1952 - 1954, undated

Box 3, Folder 1	Deuterated ammonia , undated
Box 3, Folder 2	Cesium atomic beams , undated
Box 3, Folder 3	Magnetic field calibrations , 1952 - 1954, undated
Box 3, Folder 4	C-Field calculation , 1952, undated
Box 3, Folder 5	Atomic beam measurements, 1952, undated

Subseries 4.2: Other Research Interests , 1970 - 1991, 1947 - 1957

Box 3, Folder 6	International Scientific Radio Union , 1978, 1947 - 1957, undated
Box 3, Folder 7	Health and product-related , 1970, 1990 - 1991, 1981, undated
Box 3, Folder 8	Miscellaneous notes and papers , undated
Box 3, Folder 9	Patent, 1958

Subseries 4.3: Photographs and Diagrams, 1957, undated

Box 3, Folder 10	Photographs , undated
Map-folder 1	Photographs , undated
Box 3, Folder 11	Diagrams , 1957, undated
Map-folder 1	Diagrams, undated

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Series 5: Collected Background Research Materials, 1935 - 1982

Box 3, Folder 12-13	Publications and papers , undated
Box 4, Folder 1	Publications and papers , 1935 - 1953
Box 4, Folder 2-5	Publications and papers , 1954 - 1959
Box 5, Folder 1-3	Publications and papers , 1959 - 1979
Map-folder 1	Atomic clock promotional material , 1955
Box 5, Folder 4	Atomic clock promotional material , undated
Box 5, Folder 5	Presentations and conference materials , 1950 - 1982
Box 5, Folder 6	Physics 261, molecular beams course , undated
Box 5, Folder 7	Patents, 1960, 1958

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