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## Guide to the William Webster Hansen Papers, 1928-1974

### Collection number: SC 126

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Stanford University Libraries  
Stanford, California

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#### Descriptive Summary

**Title:** William Webster Hansen Papers,

**Date (inclusive):** 1928-1974

**Collection number:** Stanford University Archives SC 126

**Creator:** Hansen, William Webster, 1909-1949

**Extent:** 4 linear ft.

**Repository:** Stanford University. Libraries. Dept. of Special Collections and University Archives.

**Language:** English

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None.

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#### Provenance

Gift of David Locke Webster, 1974

#### Preferred Citation:

[Identification of item], William Webster Hansen Papers, SC 126, Stanford University Archives, Stanford, Calif.

#### Scope and Content

This collection consists primarily of W. W. Hansen's correspondence with professional colleagues (1934-1949, Boxes 1-3), although some letters of a more personal nature are also included. These letters were in no particular order when acquired by the Archives. They have been

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arranged chronologically, incoming and outgoing correspondence interfiled, and a name index to major correspondents has been compiled. This index also covers a group of letters and memoranda dealing with the formation of the Stanford Microwave Laboratory, later re-named the Hansen Laboratory of Physics. This latter group of correspondence (Box 4, folders 40 thru 42) had been separated from Hansen's other files by his executor, D.L. Webster, who "bound" these letters together in a notebook. Major correspondents in the W.W. Hansen Papers include: Felix Bloch, Edward Bowles, Ed Condon, E.S. Erwin, Paul Kirkpatrick, Philip M. Morse, Sperry Gyroscope Co., David L. Webster, Ray Lyman Wilbur, and John R. Woodyard. Although this collection includes several letters from Hansen to the Varian brothers, there are almost none from the Varians to Hansen.

In addition to correspondence the Hansen Papers contain research notes of W.W. Hansen; bibliographic and biographic information; Hansen's account of the development of the klystron; reports re. the first linear accelerator at Stanford; unpublished manuscripts; reprints of some of Hansen's publications; copies of patents; some pieces of apparatus; and two rolls of 35mm. microfilm (film of Hansen's notebooks, evidently made by Hansen).

### **Biographical Note**

Memorial Resolution for William Webster Hansen.

William Webster Hansen died May 23, 1949. Although he had not been in the best of health since the middle of the war, Hansen's death was unexpected; only two days before it, he had inspected the office made ready for his use in the Microwave Laboratory. He is survived by his parents and his wife Betsy, daughter of the late Professor P. A. Ross of the Stanford Physics Department.

Hansen was born May 27, 1909, at Fresno, California, and received his elementary schooling in that city. Coming to Stanford, he received the A.B. in 1929, and the Ph.D. in 1933 when only 23 years of age, and then studied as a National Research Council Fellow at the Massachusetts Institute of Technology until 1935, when he returned to Stanford as an assistant professor. He became associate professor here in 1937 and professor in 1942.

Hansen's most important work has been in the border line between physics and engineering involving electromagnetic theory, electron ballistics, and advance circuit theory. He originated the cavity resonator, so important in microwave radar and radio. He contributed to the klystron tube not only the cavity resonator, but also numerous design features that are now typical of all klystron tubes. He made many contributions to the field of microwave measurements, and also originated many important mathematical developments in the theory of radio circuits and antennas. In 1944 he was recognized for this work by the Institute of Radio Engineers with the Morris Liebmann Memorial Prize.

Direct utility won recognition for the cavity resonator and for many of his improvements in radio and radar engineering; but direct utility was not Hansen's own chief interest. Primarily, he was a pure scientist. His first acquaintance with scientific things was with the fine machine tools sold by his father. From them his temperament led him naturally to the study of their principles. In this study he was greatly benefited by his father's wide experience with such matters, and by most enthusiastic aid and encouragement from both his father and his mother.

When Hansen came to Stanford as a student, his interest in the underlying principles of physical things led him to work as a research laboratory assistant; and soon the search for new laws of physics became his lifelong objective.

The cavity resonator, in fact, took shape first only in his mind, as a set of abstract mathematical functions, attractive primarily for their mathematical elegance. Then his clear vision of the meanings of mathematics showed him that real metal, made in the image of these functions, could be used with real electrons for further discoveries in physics.

Only the shadow of the coming war, which Hansen's rugged intellectual honesty forced him to recognize as real, away back in 1937, made him divert the cavity resonator and himself to military duty. This duty took him to the research laboratory of the Sperry Gyroscope Company and the Massachusetts Institute of Technology Radiation Laboratory. Returning to Stanford in 1945, Hansen combined the principles of his cavity resonator with many others learned or discovered in the meantime, and resumed his prewar purpose of developing apparatus for accelerating electrons to unprecedentedly high kinetic energy. The device he designed for this purpose is well known as the linear electron accelerator. A short section of the long linear chain of cavities in which the electrons will be accelerated has already been built. It works exactly as predicted by Hansen. This gives confidence that the rest of his plan for electrons at the equivalent of hundreds of millions of volts will be realized.

This device we shall not explain here. Hansen could. The clarity of his explanations was amazing; so, too, was their brevity. Sometimes his clear, brief explanations looked like guesswork, but they never were unless he said so. They were insight into the real essentials. Behind any explanation he did not specifically call a guess, there was always a good, thorough mathematical analysis. Moreover, he never lost the practical engineering instincts which he had acquired in his early contact with his father's work. He combined in one man the qualities of an able mathematical physicist, an equally outstanding experimentalist, and a distinguished radio engineer. He was noted among scientists because his ideas always worked.

He was noted also as a good friend, and not only among scientists. He was ready to lend a hand, or his ears, or brain, in any worthy problem, and to enliven it with unexpected humor. Bill's merry laugh shook off the troubles of many a research. It loosened thought which had bogged down. It helped us get going again along new lines.

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In the war Hansen's conscientious thoroughness was increased by his sense of military duty. Regardless of risk, he went ahead in work that brought on the illness which has now proved fatal. Though not in uniform, he was a good soldier.

Edward Leonard Ginzton

Frederick Emmons Terman

David Locke Webster, Chairman

#### **Index of Major Correspondents in Series 1 Correspondence and Series 4 Stanford University**

The following is an alphabetical list of persons who corresponded with W.W. Hansen. After their names are numbers indicating the box and folder in which letters written by them can be found. A folder entry signifies that at least one, and perhaps more, letter(s) from the correspondent in question can be found in the folder cited. It should be stressed that this index is only for major correspondents, and only lists writers of letters to W.W. Hansen.

Sample entry: Anders, David -- 1-11, 2-16

This entry indicates that there is at least one letter written by David Anders in Box 1, folder 11; and at least one letter in Box 2, folder 16.

Alpert, Dan2-152-19

American Association for the Advancement of Science -- J. Murray Luck2-18

American Physical Society, Applied Physics Committee2-16

The American Physics Teacher1-31-4

Andrews, Miles2-17

Applegate, Lindsay M.1-71-81-91-112-142-152-16

Atomic Energy Commission (AEC)see U. S. Atomic Energy Commission

Baird, Douglas O.2-22

Bennett, Willard H.3-27

Berger, Rose2-20

Bloch, Felix2-134-404-414-42

Boone, Andrew R.1-12

Bowles, Edward L.1-71-81-112-132-152-162-18

Bradbury, N. E.4-40

Breazeale, William M.2-22

Burbank, Cecil2-19

Burbridge, H. C.2-14

California, University of, Los Alamos Lab.3-243-27

California, University of, Radiation Lab.3-263-27

Carnahan, C. W. (Wes)1-102-17

Chipman, Robert A.2-16

Clark, W. Mansfield1-21-4

Condon, Ed. U.1-122-132-142-152-162-183-263-284-42

Cooksey, Donald2-173-26

Cramer, George F.2-20

Cravitz, Sam1-10

Davis, Paul H.2-174-40

de Bretteville, Alex2-13

de Forest, Lee1-41-10

DuMond, Jesse2-163-263-28

Duvall, J.F. (Gordon)1-51-92-20

Dyer, E. C.1-11

Eaton, Bourne2-19

Erwin, E. S.1-81-92-162-173-243-273-28

Eurich, A.3-26

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Everitt, W. L.3-273-28  
Federal Communications Commission U. S. Federal Communications Commission  
Feenberg, Eugene2-192-22  
Foster, J. S.2-17  
Fry, D. W.3-28  
Germer, Lester H.2-162-17  
Hansen, Laura (mother)1-1  
Hare, Donald G. C.1-72-162-182-19  
Harries Thermionics Ltd.2-17  
Harrison, George R.2-163-28  
Hartman, Milton M.2-19  
Hesthal, Cedric E.1-11  
Hildebrand, E. M.2-18  
Hill, A.G.3-263-27  
Hoffman, John W.3-28  
Hoover, Herbert, Jr.2-18  
Houston, W.V.1-83-28  
Hull, Gordon F.1-9  
Institute of Radio Engineers1-31-42-173-27  
International Standard Electric Company1-102-13  
Iskraut, Richard2-20  
Jackson, J. Hugh2-152-16  
Jaynes, Edwin T.2-223-24  
Jönsson, Torsten3-24  
Joint Research and Development Board, Committee on Electronics (Norman L. Winter, Director, Committee on Electronics)3-24  
Kaplan, Joseph3-24  
Kemalyan, Levon1-11  
Kimball, Peter2-20  
Kirkpatrick, Paul1-82-233-254-404-414-42  
Lark-Horovitz, K.1-9  
Lashier, Harvey M.2-23  
Levitt, Leo3-25  
Loomis, Alfred L.2-142-152-162-17  
Lutz, S.G.1-10  
McCay, Myron S.3-25  
McCue, J. J. G.2-17  
McGraw-Hill Book Company, Inc.2-212-22  
McMillan, Edwin M.2-22  
McRae, J. W.3-24  
Miller, W. A.1-11  
Mitchell, J. Pearce1-1  
Moon, M. L.3-27  
Moorhead, John G.1-7  
Moreno, Albert2-20  
Morse, Philip M. (MIT, Physics)1-11-71-101-112-132-16  
Moullin, E. B. (Parks Rd., Oxford)1-4  
Nahmias, M. E.1-7  
National Academy of Sciences3-28

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National Inventors Council, see U.S. Dept. of Commerce, National Inventors Council

National Research Council 1-21-31-8

New York Academy of Sciences 2-16

Newell, Robert R. 3-27

O'Connor, Cornelius 3-26

Ould, R. S. 2-202-21

Pen-Tung Sah, A. 3-27

Pettengill, George 2-17

Piston, Donald S. 1-8

Quate, Calvin F. 2-23

Rabi, I. I. 1-122-132-14

Rae, Henry 3-27

Richtmyer, F. K. 1-51-71-8

Richtmeyer, R. D. 1-8

Roe, Anne 3-273-28

Rogers, F. J. (S. U. Dept. of Physics) 1-1

Saveliev, V. (Russian physicist) 1-11

Seely, L. B. 3-263-27

Seifriz, William 2-18

Seitz, Fred 2-13

Shockley, Wm. 1-72-132-15

Siegert, Arnold 2-192-202-21

Silverman, Milton 1-9

Slater, John C. 3-263-27

Slepian, J. 2-16

Smith, E. H. 1-12

Spangenberg, Karl 2-21

Sperry Gyroscope Co. also the following: 2-212-222-233-243-263-27

Basset, P. R. 1-92-142-17

Hunter, Paul 1-71-81-91-101-111-122-132-142-152-183-254-41

Jenks, F. 2-18

Thompson, H. H. 1-8

Willis, H. Hugh 1-61-91-101-112-142-152-162-172-18

Staub, H. H. 1-8

Stein, William E. 2-22

Stratton, J. A. 1-9

Strong, John 1-5

Tatel, Howard 2-20

Terman, Frederick 2-214-414-42

Tresidder, D. 2-212-224-40

Tuck, James L. 1-10

U.S. Atomic Energy Commission, Oak Ridge, Tennessee 3-26

U.S. Dept. of Commerce, National Inventors Council 2-19

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Watkin, R. L. 2-18

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Weber, Ernst1-12

Webster, David Locke1-21-61-71-81-91-101-111-122-132-154-40

Westinghouse Co. McCurdy, W. H.(see also Condon)2-16

Whitaker, Douglas (acting Vice-President, S. U.)3-26

White, F. W. (New Zealand physicist)1-4

Wilbur, R. L.1-21-112-152-162-17

Williams, W. Ewart2-16

Willis, Hugh(see also Sperry Gyroscope Co.)3-24

Wilson, Edgar Bright1-10

Woodyard, J. R.1-71-101-112-162-20

**Series 1 Correspondence, 1928-1949**

Box 1, Folder 1	<b>Correspondence 1928-1934</b>
Box 1, Folder 2	<b>Correspondence 1936, January-August</b>
Box 1, Folder 3	<b>Correspondence 1936, Sept.-Dec.</b>
Box 1, Folder 4	<b>Correspondence 1937, Jan.-Apr.</b>
Box 1, Folder 5	<b>Correspondence 1937, May-Oct.</b>
Box 1, Folder 6	<b>Correspondence 1937, Nov.-Dec.</b>
Box 1, Folder 7	<b>Correspondence 1938, Jan.-April</b>
Box 1, Folder 8	<b>Correspondence 1938, May-August</b>
Box 1, Folder 9	<b>Correspondence 1938, Sept.-Dec., plus 1938, undated</b>
Box 1, Folder 10	<b>Correspondence 1939, Jan.-Feb.</b>
Box 1, Folder 11	<b>Correspondence 1939, Mar.-May</b>
Box 1, Folder 12	<b>Correspondence 1939, June-July</b>
Box 2, Folder 13	<b>Correspondence 1939, August-Sept.</b>
Box 2, Folder 14	<b>Correspondence 1939, Oct.-Dec.</b>
Box 2, Folder 15	<b>Correspondence 1940, Jan.-Feb.</b>
Box 2, Folder 16	<b>Correspondence 1940, Mar.-July</b>
Box 2, Folder 17	<b>Correspondence 1940, Aug.-Oct.</b>
Box 2, Folder 18	<b>Correspondence 1940, Nov.-Dec., also 1940 undated</b>
Box 2, Folder 19	<b>Correspondence 1941</b>
Box 2, Folder 20	<b>Correspondence 1942</b>
Box 2, Folder 21	<b>Correspondence 1943, 1944</b>
Box 2, Folder 22	<b>Correspondence 1945</b>
Box 2, Folder 23	<b>Correspondence 1946</b>
Box 3, Folder 24	<b>Correspondence 1947, Jan.-Sept.</b>
Box 3, Folder 25	<b>Correspondence 1947, Oct.-Dec.</b>
Box 3, Folder 26	<b>Correspondence 1948, Jan.-May</b>
Box 3, Folder 27	<b>Correspondence 1948, June-Dec.</b>
Box 3, Folder 28	<b>Correspondence 1949, Jan.-May</b>

**Series 2 Biographical Materials**

- Box 3, Folder 29     **Death of W.W. Hansen**
- Scope and Content Note**
- Contents of file include texts of eulogies; telegrams of condolence; obituary clippings; Memorial Resolution of the Stanford Academic Council; article on beryllium poisoning; published Biographical Memoir of William Webster Hansen, 1909-1949, by Felix Bloch, presented to the National Academy of Sciences, 1952; The Uncommon Man, 1951.
- Box 3, Folder 30     **Death of W.W. Hansen**
- Scope and Content Note**
- Contents of file include official documents, bills, receipts re. last illness and death of W.W. Hansen.
- Box 3, Folder 31     **David Locke Webster - Correspondence and notes relating to the estate of W.W. Hansen**
- Scope and Content Note**
- Contents of this file include numerous memos written by Dr. Webster "for the record" re. the Hansen "Papers"; correspondence re. disposition of certain of Hansen's effects, including notes for a book (see also folder 5-51 "Ruling Engine").
- Box 3, Folder 32     **Biographical material**
- Scope and Content Note**
- Contents of this file include Hansen's birth certificate; a mathematical problem he worked as a child; his Stanford transcripts; his thesis; an announcement of his marriage; and a personnel security questionnaire.
- Box 3, Folder 33     **Bibliographies; Lists of Activities**
- Scope and Content Note**
- Contents include Bibliography in Felix Bloch's Biographical Memoir of W.W. Hansen, and a statement of Hansen's (1937) listing his publications and activities at that time.
- Box 3, Folder 34     **National Research Fellowship (1933), application for**
- Scope and Content Note**
- Contents of file include several copies of application form filled out by W.W. Hansen, as well as copies of abstracts of scientific papers by Hansen, submitted with his application.

**Series 3 The Klystron**

Box 4, Folder 35     **The Klystron**

**Scope and Content Note**

Contents include "Statement of William W. Hansen", n. d., typed, 48p., with typed comments by D.L. Webster, 4 p.; "The Klystron as a generator of very short waves", by W.W. Hansen, R.H. Varian, et al., 2 p., typed carbon copy, n. d.; "Causes of frequency variation in Klystron oscillators", by W.W. Hansen, R.H. Varian, et al., typed carbon copy, 12 p., n. d.

Box 4, Folder 36     **Clippings re Varian Brothers**

Box 4, Folder 37     **Orders for the Klystron**

**Scope and Content Note**

Includes invoices, checks, instruction manuals, and some correspondence re. Klystrons made in 1940 at Stanford and sold to Sperry Gyroscope Co.

Box 4, Folder 38     **Popular accounts of its development**

**Scope and Content Note**

Includes magazine articles; TV show script; Varian Associates, Inc. 25 year anniversary booklet. Also copy of typescript of Edward Ginzton's account, The \$100 Idea., ca. 1974

**Series 4 Stanford University, 1942-1949**

**Physics Department**

- Box 4, Folder 39 **Records, 1945-1949, including announcements; class teaching assignments; some committee minutes; and copies of the departmental newsletter.**

**Microwave Laboratory, 1942-1948**

**Scope and Content Note**

Folders 4-40 through 4-42 contain correspondence, chronologically arranged, re. the establishment of the Microwave Laboratory at Stanford (reorganized and renamed W.W. Hansen Laboratories of Physics in 1953), with some correspondence on the physics department. According to a memo written by Prof. D.L. Webster Dec. 19, 1949, and included in folder 4-40, Prof. Webster arranged this correspondence from the files of Prof. Hansen after the latter's death.

- Box 4, Folder 40 **Microwave Laboratory, correspondence on the origins of, 1942-43**  
Box 4, Folder 41 **Microwave Laboratory, correspondence on the origins of, 1944-June 1945.**  
Box 4, Folder 42 **Microwave Laboratory, correspondence on the origins of, July 1945-1948**  
Box 4, Folder 43 **Microwave Laboratory - miscellaneous**

**Scope and Content Note**

Includes "The Microwave Laboratory; a plan for the foundation of a laboratory at Stanford University"; Dec. 30, 1942; n.a.; typed carbon copy. Also newspaper clipping re. the lab.

**Linear Electron Accelerator Project, 1946-1948**

- Box 4, Folder 44 **Report no. 1, [1946], mimeo copy, with D.L. Webster's comments (holograph)**  
Box 4, Folder 45 **Reports nos. 2 and 3 (Dec. 18, 1946, and Jan. 4, 1947). [Report no. 4 is missing]**  
Box 4, Folder 46 **Reports, nos. 5-9, (March 1947-July 1947)**  
Box 4, Folder 47 **Reports, nos. 10, 11, 12 (1947-1948)**  
Box 4, Folder 48 **Miscellaneous**

**Scope and Content Note**

Contents include some correspondence; clippings; draft sketch of floor plan; "Proposed billion volt accelerator, rough draft", typed carbon copy, n.a., n.d.; "Proposal for the production of super energy electrons", n.a., n.d.; "Survey of possible experiments with linear electron accelerators", by Leonard Schiff, Nov. 1949, report no. 102.

**Series 5 Notes, Publications, and Other Papers, 1932-1949**

- Box 4, Folder 49     **"Notes re. E and M, 1932"**  
**Scope and Content Note**  
Research notes of W.W. Hansen and D.L. Webster.
- Box 4, Folder 50     **Sparrows Point - Manx Fisher Collision at Sea, 1947**  
**Scope and Content Note**  
Two-boat collision at sea caused by radar failure. W.W. Hansen retained as consultant expert. Folder contains research notes, correspondence, etc. re. the case.
- Box 5, Folder 51     **The Ruling Engine**  
**Scope and Content Note**  
W.W. Hansen's notes and other material on a design for a ruling engine. This project was not completed before his death. The folder includes correspondence, post 1949, between D.L. Webster and various individuals interested in Hansen's designs.
- Box 5, Folder 52     **Antenna Research**  
**Scope and Content Note**  
"Proposed program, slot antenna research", typescript, n.d.; "Miniature slot antennas", typescript, n.d.; article by Virgil A. Countir.
- Box 5, Folder 53     **Publications, misc. -- pre-1940**  
Box 5, Folder 54     **Publications, misc. -- 1941-1949**  
Box 5, Folder 55     **Miscellaneous notes and Unpublished Manuscripts**  
Box 5, Folder 56     **Miscellaneous graphs**  
Box 5, Folder 57     **Patents**  
**Scope and Content Note**  
Folder includes copies of actual patents plus correspondence re. them.
- Box 5, Folder 58     **Personal Finances**  
**Scope and Content Note**  
Folder includes income tax information, life insurance payments, lists of stocks, etc.
- Box 5, Folder 59     **Miscellaneous**  
Box 6                 **Apparatus**  
**Scope and Content Note**  
Diaphragms made for Hansen's accelerator in 1946 or 1947; Tophet A (nickel chrome); Klystron grids; 2 strips 35 mm. microfilm (notebooks of W.W. Hansen?).
- Box 6, Folder 60     **Photographs**  
Volume 7 folio     **Scrapbook**  
**Scope and Content Note**  
Contains clippings, photos, and other memorabilia, a few items of correspondence (most were removed). Scrapbook evidently kept by W.W. Hansen's mother.

Volume 8 folio

**Scrapbook**

**Scope and Content Note**

Contains primarily photos and reprints. Probably kept by W.W. Hansen's mother.