



THE ARCHIVES OF THE
CALIFORNIA INSTITUTE OF TECHNOLOGY

THE PAPERS OF CLARK B. MILLIKAN

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THE PAPERS OF CLARK B. MILLIKAN

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THE PAPERS OF CLARK B. MILLIKAN

BIOGRAPHICAL SKETCH

CLARK BLANCHARD MILLIKAN, the son of Nobel Prize recipient Robert A. Millikan, was born in Chicago in 1903. Born in the same year that the Wright brothers first flew their aircraft at Kitty Hawk, Clark Millikan would later become one of the nation's foremost pioneers in aerospace research and development.

Only eight years old when he decided to make his vocation aeronautics, Millikan pursued his dream by first obtaining from Yale an undergraduate degree in science and then from Caltech his PhD in 1928, completing his dissertation on the "Steady Motion of Viscous Fluids" under the guidance of Harry Bateman. Upon completing his degree, Millikan joined the Caltech faculty and began teaching aeronautics within the Division of Civil and Mechanical Engineering. Millikan also continued to pursue research in aeronautics and soon formed productive relationships with several Southern Californian aircraft companies.

Integral to this research and these relationships was Millikan's longstanding involvement with the Guggenheim Aeronautical Laboratory at the California Institute of Technology (GALCIT) and the Southern California Cooperative Wind Tunnel (SCCWT). With Theodore von Kármán as its first director and with its 200 m.p.h. wind tunnel, GALCIT—established with a generous endowment from Daniel Guggenheim—enabled Millikan and the rest of the laboratory's personnel to make large strides in the advancement of aeronautic engineering. During the Second World War, for example, Millikan helped advance many of the U.S. military's most sophisticated aircraft and ordnance, while, following the war, Millikan was heavily involved in using the wind tunnel to test, analyze, and solve the aerodynamic problems that accompanied the development of high-speed aircraft, and, eventually, guided missiles. Indeed, the wind tunnel serves to exemplify Millikan's ability to link the worlds of industry, academia and the military.

While research always remained important for Millikan, his work as an administrator and advisor is also noteworthy. Following the war, he became a key component of Pasadena's Jet Propulsion Laboratory (JPL). From 1949 until his death in 1966, Millikan served as GALCIT's director, while he also served as chairman of the Scientific Advisory Committee for Defense, of the Air Force Ballistics Missiles Committee and of the Air Force Scientific Advisory Board. In addition, and among

many other things, he served as a member of the Naval Advisory Committee, the National Committee of Aeronautics, the Los Angeles Committee on Foreign Relations, and the U.N. Association.

Millikan regularly spoke to interested groups. He addressed technical and non-technical audiences, professional groups, women's clubs, or social clubs, like the Sunset Club and others, of which he was a member. Developments in aeronautics paralleled Millikan's own interests. The changing nature of his lectures evolved with advancing technologies: "The Influence of Running Propellers on Airplane Characteristics" of 1939 is characteristic of his pre-War work; "The Dawn of the Supersonic Age" (1949) and "The Guided Missile: Precocious Problem Child of the Military Act" (1951) are characteristic of his post-War interests; and his 1963 "What to do With Space?" is indicative of his interests during the Cold War.

Millikan's professional honors include honorary fellowships in the Institute of Aeronautical Sciences (later the American Institute of Aeronautics and Astronautics), and the Royal Aeronautical Society of Great Britain. He also received the United States Presidential Medal of Merit. His professional affiliations included the American Society of Mechanical Engineers, the American Physical Society and the American Academy of Arts and Sciences. However, during his lifetime, and despite his distinguished track-record, Millikan was also known for his warm character, approachability and collegial nature.

SCOPE AND CONTENT OF THE COLLECTION

THIS COLLECTION documents C. B. Millikan's role as a pioneer in the field of aeronautics in its academic, commercial, and popular aspects. It also offers a glimpse of the private man, through correspondence with long-time friends and colleagues, and through the diaries Millikan kept. The collection itself is divided into seven main series and numerous sub-sections which reflect his various professional activities and personal interests. It should be noted, however, that many similar documents are scattered throughout the collection. Thus, while an entire series is devoted to GALCIT, documents involving Millikan's affairs at GALCIT are located in numerous sections. Similarly, materials related to von Kármán can be found in every section.

Series I, Personal, publication and general correspondence comprises approximately one-fifth of the collection. Containing material from the 1920s to the 1960s, the correspondence provides access into most elements of Millikan's life and career.

Included among the correspondents is Harry F. Guggenheim, Theodore von Kármán, McGraw-Hill and *Time Magazine*.

Millikan's research and advisory roles often involved branches of the U.S. government and the U.S. military. The second series focuses on this involvement, particularly his association with the Aeronautical Advisory Council and the Department of Defense. Of course, much of Millikan's work for the Government transpired during the Second World War; but the series also contains miscellaneous other work—for instance, his role in the President's Scientific Advisory Committee and the Air Force's Space Systems Division Advisory Group in the early 1960s.

The third series evinces the diversity of Millikan's professional activities. Ranging from the National Academy of Sciences and the Western Metals Congress to the Ford Foundation and the Atlantic Council's Committee on Foreign Relations, the section also encompasses the multitude of educational bodies with whom Millikan collaborated. Series IV, on the other hand, is limited to one specific educational body—Caltech—although, like the other elements of Millikan's career, the facets of his involvement in the Institute's operations were manifold. As such, the series contains materials related to general administrative duties, the Caltech Flying Club and the civilian pilot training program. Most of the materials, however, relate directly to GALCIT: Millikan's correspondence as GALCIT's director (1949-66), government research contracts, faculty appointments and student instruction.

Millikan's diverse writings—lectures, speeches, book manuscripts, journal articles—comprise Series V. Within the section are manuscripts, galleys and reprints, as well as notes, correspondence and printed material related to the composition of the writings. Encompassing five decades, the writings reflect Millikan's changing interests and the progression of flight. The writings also reflect the different audiences whom Millikan was addressing, be it the Faculty Women's Club, the American Physics Society, or readers of the most specialized journals in aeronautics.

Whereas Series V evinces Millikan's ability to address general audiences, the following section represents the highly technical side of his career. Series VI, "Research and Technical Files," contains a collection of reprints that Millikan collected throughout his career, as well as copious notes, experimental results, calculations and drawings. Topics include early research in biplane theory, calculations on "porpoising," reports to Douglas Aircraft and analyses of wake turbulence. Also included in the series are sub-sections containing photographic slides and Millikan's involvement in industrial relations.

The final section, Series VII, contains various personal and biographical material. For a quarter of a century Millikan was a dutiful diarist: his diaries (1940-65) largely

contain a day-by-day record of meetings, trips and various administrative matters regarding the Cooperative Wind Tunnel, the Jet Propulsion Laboratory and defense related activities. Yet also recorded on a daily basis are personal items: family matters, illnesses, social engagements and sporting activities. In addition to his diaries are a number of personal scrapbooks (1956-64), as well as material related to the clubs and associations to which Millikan belonged, that offer a good glimpse into aspects of his life, both professional and personal.

Carolyn Harding 1976

Revised: Kevin C Knox 2002

CLARK B. MILLIKAN

SERIES I: CORRESPONDENCE

A. PERSONAL CORRESPONDENCE

Box 1

- 1.1 Adams, Alvin P. 1942
Allen, Edmund T. 1934-36
- 1.1 *cont.* Baron, Leo 1942
Battle, Turner Westray 1963
Beck, H. W. 1935-36
BelGeddes, Norman 1934
Berdie, H. W. 1942
Bovard, James M. 1938, 1963
Boyer, Jr., Robert 1942
Brown, (Mrs.) Robert E. 1960-61
Burden, William A. M. 1964
Burke, R. J. 1958-61
- 1.1 *cont.* Caldwell, Frank W. 1940
Chatfield, Charles H. 1939
Clark, V. E. 1940
Clark, Meritt 1938
Cochran, Jacqueline 1940
Colgate, Robert 1938
Coolidge, Sollace B. 1954
Courtright, Hernando 1963
Craigie, L. C. 1957
- 1.1 *cont* Daasch, Harry L. 1942
Dearborn, L. Emery 1965
de Ganahl, Carl 1938
Diehl, Walter S. 1957, 1964
Doolittle, J. H. 1935
Dreyfuss, Henry 1957
Duque, Henry O. 1950-54
- 1.2 Fairchild, Sherman M. 1942
Fiske, Robert and Nonie 1963-65
Fleet, Reuben H. 1965
Frye, Jack 1934-37

- 1.2 *cont* Gargan, William D. 1965
 Geer, William C. 1939
 Gongwer, Calvin A. 1964
 Gross, Robert E. 1940
 Guggenheim, Harry F. 1941
- 1.2 *cont* Haddon, Robert J. 1963
 Haley, Andrew G. 1963
 Hall, Newman A. 1942
 Hardin, Adlai and Carol 1961
 Hicks, Bruce L. 1960
 Hickson, H. 1956-57
 Hogan, C. C. and Beecher 1959
 Hoskins, Harold 1956-65
 Hotchkis, "Bix" 1964
 Hubbard, Otis L. 1962
 Hunsaker, J. C. 1933-36, 1941, 1946, 1950
- 1.2 *cont* Johnson, R. B. 1939
- 1.3 Klagsbrunn, Hans A. 1957-64
- 1.3 *cont.* Lichine, Alexis 1957
 Lombard, A. E. 1935
 Luby, Maurice 1961
 Lyon, Hilda 1934
- 1.3 *cont.* Malina, Frank 1965
 Marquardt, Pat 1957
 Martin, Erle 1940-41
 Merkel, Otto J. 1939-41
 Merrill, A. A. 1926-27, 1930-31
 Millar, John 1964
 Miller, William 1934
 Millikan, Allen F. 1960
 Mills, Roscoe 1934, n.d.
 Molloy, Richard C. 1941-42
 Mosher, Charles A. 1963
- 1.3 *cont.* Noble, Jane 1958
- 1.4 Oppenheimer, J. Robert 1950
 Osborn, Earl D. 1933
 Osborn, Robert R. 1935

- 1.4 *cont.* Paloheimo, E. 1960
 Parish, E. W. 1959, 1962, 1964
 Perkins, K. 1957
 Piatigorsky, J. 1961
 Pillsbury, P. 1947, 1960-65
 Pomeroy, R. W. 1959, 1960, 1964
 Poor, C. L. 1962
 Poyer, H. M. 1941
 Primrose, Mrs. A. F. 1963
 Putnam, L. H. 1958, 1962
 Putt, D. L. 1965
- 1.4 *cont.* Reilly, J. R. 1940
 Rethorst, Scott 1942
 Richter, Paul 1942
 Robbins, Richard 1933
 Robischon, "Robie" 1964
 Roosevelt, President 1934
 Russell, James 1958, 1960
 Russell, John M. 1939
- 1.5 Sechler, E. E. 1939
 Smith, C. R. 1937
 Smith, H. Allen 1963
 Smith, Lynn 1953
 Stanley, Paul 1941
 Stanley, Robert M. 1940, 1942
 Steindler, Mrs. Seymour (includes 2 photographs) 1961, 1962
 Storment, A. M. 1941
- 1.5 *cont.* Tillinghast, G. C. 1939, 1963
 Tomlinson, D. W. 1938
 Torrence, G. P. 1963
 Tyler, M. 1959-65
- 1.5 *cont.* Unterberg, C. 1961-64
- 1.6 Van Antwerp, W. M. 1962
 von Kármán, T. (and Aachen correspondence) 1926-31, 1933-35, 1937
 Vultee, Gerard 1935
- 1.6 *cont.* Walker, E. W. 1942
- 1.6 *cont.* Walker, John B. 1959
 Walkowicz, T. F. 1963
 Warner, E. P. 1937-38
 Wesley, David 1963

West, Owen A. 1964
Wibault, Michael 1940
Wilson, Osborne 1963
Wood, Arthur 1964
Woodward, Harper 1956

Zisch, William E. 1964

1.6 *cont.*

B. PUBLICATION AND GENERAL CORRESPONDENCE

Box 2

- 2.1 California State Aviation Sub-Committee 1944-45
- 2.2 City of Los Angeles, Space Advisory Committee 1964-65
- 2.3 Department of Commerce 1933
- 2.4 Guggenheim Foundation 1942, 1947-52
- 2.5–2.7 International Correspondence 1927-51 [3 folders]
John Wiley and Sons, incorporated
- 2.8–2.9 *Aerodynamics of the Airplane* 1940-45 [2 folders]
- 2.10–2.11 GALCIT Series and miscellaneous 1935-44 [2 folders]
- 2.12 General Advisory Board 1943-45

Box 3

- John Wiley and Sons, incorporated *cont.*
- 3.1 “Performance,” Millikan, Allen and Moore 1938-44
- 3.2 Wright Field and other outside correspondence 1943-44
- 3.3 Miscellaneous correspondence 1955-58
- 3.4 *Aerodynamics of the Airplane: correspondence re* 1947-58
- 3.5 Contracts and royalties 1939-59
- Los Angeles Chamber of Commerce
- 3.6–3.8 Aviation Committee 1940-44 [3 folders]
- 3.9 Committee on Fixed Base and Private Flying 1944-45
- McGraw-Hill
- 3.10 “Aviation” 1944-46
- 3.11 General Correspondence 1942-46
- 3.12 National Committee for the Development of Scientists and Engineers
1957
- 3.13 Pergamon Press 1959-60
- 3.14 Publishers, including newspapers 1928-45

- 3.15 Publishers, other
 - Time Magazine*
 - Turk Havakurumu
 - TWA News Bureau
 - Vliegwereld
 - 3.16 *Aircraft Engineering* 1933
 - 3.17 Publication correspondence *re* "Guided Missiles" 1951-52
 - Publication correspondence: miscellaneous
 - 3.18 1929-42
 - 3.19 1959-65
 - 3.20 "The Present Status of the Problem of the Airfoil with Hinged Flap,"
(unpublished) ca. 1929
 - 3.21 *Zentralblatt für Mechanik* 1935-40
-

SERIES II: GOVERNMENT

Box 4

- 4.1 Advisory Commission to the Council for National Defense 1940
- Aeronautical Advisory Council, Department of Commerce
- 4.2 Accident Report, United Air Lines Nov 4, 1940; Dec 11, 1940
- 4.3-4.4 Committee on Civil Aeronautics Authority July 1940-April
1941 [2 folders]
- 4.5 Congressional Investigative Data 1941
- 4.6 Equipment Agreement 1936
- 4.7-4.9 General Information 1940-42 [3 folders]
- 4.10 Minutes, Agenda, Reports 1940-41
- 4.11 Notebook, General Information

Box 5

- Civil Aeronautics Administration, Department of Commerce
- 5.1 Bureau of Standards 1930-45
- 5.2 Miscellaneous 1946
- 5.3-5.4 Congressional Aviation Policy Board 1946-48 [2 folders]
- Department of Defense
- Defense Science Board
- 5.5 Miscellaneous 1962-64
- 5.6 Subcommittee on Defense Contract Effort Report 1964

- 5.7 Subcommittee on the Military Role in Space 1962-63
- 5.8 Scientific Advisory Committee 1957-61
- 5.9 National Security Organization 1948-50
- National Defense Research Committee
- 5.10 1940-41
- 5.11 1941-45
- 5.12 1941-44

Box 6

- Navy Technical Mission in Europe (NAVTEC MISEU)
- 6.1 Miscellaneous n.d.
- 6.2 Reports 1945
- 6.3 President's Scientific Advisory Committee 1959-65
- United States Air Force
- 6.4 Management Study Committee 1959-60
- Scientific Advisory Board
- 6.5 Executive Committee Meetings 1965
- 6.6 Intercontinental Ballistic Missile Program 1953-60
- 6.7 Miscellaneous 1962-65
- 6.8 Printed Matter 1955-63
- 6.9 Space Systems Division Advisory Group 1963-65
- 6.10 Systems Command 1959-65
- United States Army
- 6.11-12 Ballistic Research Laboratories 1954-65 [2 folders]
- 6.13 *Wings* magazine 1961-65

**SERIES III: PROFESSIONAL ORGANIZATIONS, MEETINGS AND
EDUCATIONAL BODIES**

Box 7

- American Academy of Arts and Sciences
- 7.1 1959
- 7.2 1965
- 7.3 American Association of University Professors 1958
- 7.4 American Institute of Aerological Research 1961
- American Institute of Aeronautics and Astronautics
- 7.5 1963-64

- 7.6 1965
- 7.7 Hill Award 1962-65
- 7.8 American Legion National Aeronautics Commission 1942
American Physical Society
- 7.9 1948
- 7.10 1953-65
American Society of Mechanical Engineers (ASME)
- 7.11 1931-32
- 7.12 1933-39
- 7.13 American Society for Engineering Education 1961-62
- 7.14 American Standards Association, Committee on Standardization of
Letter Symbols for Aeronautics and Aerodynamics 1947-49
Atlantic Council, Committee on Foreign Relations
- 7.15 1962
- 7.16 1963

Box 8

- Atlantic Council, Committee on Foreign Relations *cont.*
- 8.1 1964
- 8.2 Directory 1961
- 8.3 Fifth International Congress of Applied Mechanics 1938
- 8.4 Ford Foundation 1960-62
Institute for Defense Analysis
- 8.5 Correspondence 1962-64
- 8.6 Printed matter 1964-65
National Academy of Engineering
- 8.7 Committee on Membership 1965
- 8.8 Correspondence 1964-65
- 8.9 Printed Matter 1965
- 8.10 National Academy of Sciences 1964-65
- 8.11 National Aeronautics Association 1936, 1939, 1941-42
National Science Foundation
- 8.12 Divisional Committee for Engineering 1964-65
- 8.13 Reviews of Grant Proposals and Fellowship 1958-63
- 8.14 Royal Aeronautical Society 1963-65
- 8.15 Western Metals Congress 1937-38
- 8.16 YMCA 1960-62

Box 9

Educational Bodies

- 9.1 Airship Institute 1929-34, 1939, 1941
- 9.2 Center for Advanced Study of the Aeronautical Sciences
(CASAS) 1946
- 9.3 Cornell 1954-64
- 9.4 Deutsch Academy and Lilienthal Gesellschaft 1937-39
- 9.5 Georgia Institute of Technology 1930-40
- 9.6 Göttingen University 1927-32
- 9.7 Harvard University 1937-41
- Johns Hopkins University
- 9.8 1946-48
- 9.9 1959-64
- 9.10 Louisiana State University 1938-41
- Massachusetts Institute of Technology
- Miscellaneous Correspondence
- 9.11 1927-30, 1932-42, 1946-48
- 9.12 1954-64
- 9.13 Lexington Project 1948-50
- New York University
- 9.14 1926-40
- 9.15 1957-62
- 9.16 Princeton University 1956-63
- 9.17 Purdue University 1954-60
- Stanford
- 9.18 1926-33, 1935, 1937-41, 1945
- 9.19 1957
- 9.20 Stevens Institute of Technology 1926-45
- 9.21 University of California (Berkeley and Los Angeles) 1957-65
- University of Michigan
- 9.22 1935-42
- 9.23 1954-63
- 9.24 University of Minnesota 1928-42
- University of Washington
- 9.25 1929-37
- 9.26 1952-60
- Universities, miscellaneous correspondence
- 9.27 1928-42
- 9.28 1959-63

SERIES IV: CALTECH

A. GENERAL

Box 10

- 10.1 Aeronautical Chamber of Commerce, Performance Testing 1927-31
- 10.2 Civilian Pilot Training Program 1940-42
- Cooperative Wind Tunnel (CWT)
 - 10.3 Budgets and organization 1943-46
 - 10.4 Funding: correspondence and documents 1940
 - 10.5 Publications *re* 1943-58
 - 10.6 Correspondence 1926-36
 - 10.7 Correspondence and newsletters 1960-64
 - 10.8 Guided missiles 1949-56
- Correspondence
 - British
 - 10.9 1942-50
 - 10.10 1946-50
 - 10.11 Millikan, R.A. 1928
 - U.S. Government
 - 10.12 Select Service 1940-44
 - 10.13 Miscellaneous 1942-45
 - Division of Engineering
 - 10.14 F.C. Lindvall (correspondence) 1958-65
 - 10.15 Division reports 1962-65
 - 10.16 Division advisory group 1962-63
 - 10.17 Division committee ca. 1963
 - 10.18 Faculty CVs ca. 1965
 - 10.19 Ad hoc advisory committee 1965
 - 10.20 Faculty discussion group 1961
 - 10.21 Flying Club (Caltech) 1965

Box 11

- Guggenheim Jet Propulsion Center
 - 11.1 Fellowships 1948-49
 - 11.2 General 1947-49

- 11.2.1 Joint Committee of Trustees and Faculty (re: Pauling's termination) ca 1950
- Meteorology
- 11.3 Course outline n.d.
- 11.4 Correspondence 1933-38
- 11.5 Weather Bureau n.d.
- 11.6 National Defense 1940-41
- Special Classes for Military Personnel
- 11.7–11.9 Engineering Defense Training (EDT) 1940-44 [3 folders]
- 11.10–11.16 Engineering Science and Management Defense Training (ESMDT) 1940-49 [7 folders]

Box 12

- Special Classes for Military Personnel *cont.*
- 12.1–12.5 Engineering Science and Management Defense Training (ESMDT) 1940-49 [5 folders]
- 12.6–12.11 Engineering, Science and Management War Training (ESMWT) [6 folders]
- 12.12 Special Classes for Industry n.d.
- 12.13 Students 1929-45

B. GALCIT

I. FACULTY, STAFF, STUDENTS AND ADMINISTRATION

Box 13

- Director's Correspondence
- 13.1 Advanced Research Projects Agency 1960-63
- 13.2 Aircraft Companies: various correspondence 1961-62
- 13.3 Dean of Graduate Students 1949-54
- 13.4 DuBridge, Lee 1958-65
- 13.5 Employment announcements/searches 1960-65
- 13.6 Former Students 1963-65
- 13.7 Government Agencies 1962-65
- 13.8 Guggenheim (and Pendray & Cook) 1959-65
- "International"
- 13.9 Australian and New Zealand 1960-65
- 13.10 British 1957-65
- 13.11 Canadian 1958
- Foreign

- 13.12 Argentina-India 1959-65
- 13.13 Italy-Viet Nam 1959-65
- 13.14 "Inventors" 1959-65
- 13.15 NASA 1958-65
Reference letters
- 13.16 Ahlstrom-Hesse ca. 1960-65
- 13.17 Hilbert-Yeneriz ca. 1960-65
- 13.18 Staff: misc. correspondence 1961-65

Box 14

Administration

- 14.1 Contributions: Alumni Fund and other 1964
Data for President's and Annual Reports
- 14.2 1944-49
- 14.3 1950-59
- 14.4 1964-65
Fiscal reports
- 14.5 1961-62
- 14.6 1963-65
- 14.7 Future Programs and planning committees 1958-64
- 14.8 Library: data and correspondence 1953-63
- 14.9 GALCIT Open House Mar 1962
Scholarships and Fellowships
- 14.10 1956-61
- 14.11 1962-65
- 14.12 Staff meetings: minutes and data 1952-65
Buildings, laboratories and equipment
- 14.13 Shop Time analysis 1951-53
- 14.14 Laboratory equipment 1946, 1960-65
- 14.15 Security issues 1962-65
- 14.16 Building safety matters 1960-65

Box 15

GALCIT Faculty and Staff

Appointments

- 15.1 1953-56
- 15.2 1957-58
- 15.3 1959-60

15.4	1961-63
15.5	1964-65
15.6	Biographical data ca. 1958-65
	Visiting professors
15.7	1958-60
15.8	1960-65
15.9	Immigration: students and faculty 1954-65
15.10	Employment matters 1964-65
	T. von Kármán
15.11	75 th anniversary 1955-56
15.12	Biographical sketches and obituaries 1954-63
15.13	Biographical material and correspondence <i>re</i> 1958-63
15.14	Kármán and Epstein memorials 1963-65
15.15	Personnel Office 1964-65

II. RESEARCH AND CONTRACTUAL PROJECTS

Box 16

Government research projects

16.1	"GALCIT training contracts" 1945-47
16.2	"GALCIT 3" 1944
16.3	"GALCIT 4" 1943-44
16.4	"GALCIT 6" 1942-46
16.5	"GALCIT 7" 1943-44
16.6	"GALCIT 8" 1945
16.7	"GALCIT 9" 1943-46
16.8	"GALCIT 10" 1944
16.9	"GALCIT 11" 1944
16.10	"GALCIT 12" 1943-45
16.11	"GALCIT 13" 1943-45
16.12	"GALCIT 14" 1943-46
16.13	"GALCIT 15" 1943-45
16.14	"GALCIT 16" 1943-46
16.15	"GALCIT 17" 1943-46
16.16	"GALCIT 18" 1944
16.17	"GALCIT 19" 1943-44
16.18	"GALCIT 20" 1944
16.19	"GALCIT 21" 1944
16.20	"GALCIT 22" 1944-46

16.21	"GALCIT 23" 1944
16.22	"GALCIT 24" 1944-47
16.23	"GALCIT 25" 1944-47
16.24	"GALCIT 26" 1944-45

Box 17

17.1	"GALCIT 27" 1945-48
17.2	"GALCIT 28" 1945
17.3	"GALCIT 29" 1945-48
17.4	"GALCIT 31" 1946
17.5	"GALCIT 32" 1945
17.6	"GALCIT 41" 1945-47
17.7	"GALCIT 42" 1946-48
17.8	U.S. Army Research Office: hypersonic and plasma research 1963-65
17.9	Research proposals 1948-63
17.10	Research problems and surveys 1961-64
17.11	Committee on Sponsored Research 1963-65
17.12	NASA: research suggestions 1965 10' Wind Tunnel
17.13	Staff security clearances 1955
17.14	Security issues 1949-55
17.15	Testing schedules 1960-65
17.16	Miscellaneous correspondence 1957-62

III. STUDENT INSTRUCTION

Box 18

	Course curricula (including correspondence <i>re</i>)
18.1	1951-59
18.2	1960-65
18.3	Student statistics 1949-65
18.4	Theses projects (including correspondence <i>re</i>) 1956-64
18.5	Graduate admissions 1956-65
18.6	Graduate theses topics 1929-63 Curricula review
18.7	1961-62
18.8	1960-65
18.9	GALCIT exams (miscellaneous) 1929-65

18.10 GALCIT PhD exams 1947-55

Aeronautical Engineering (AE) Courses

AE 261 exams

18.11 1948-50

18.12 1950-54

18.13 AE 261: miscellaneous material 1949-50

Box 19

AE 201: Inviscid fluid mechanics (formerly AE 261)

19.1-2 Course text 1958 [2 folders]

Exams

19.3 1954-58

19.4 1958-61

Problem sets and course material

19.5 1959-63

19.6 1964-65

19.7 AE 204: Exams 1959-61

AE 266; AE 268: Exams

19.8 1929-50

19.9 1950-54

19.10 Miscellaneous GALCIT exams 1929-65

Box 20

Millikan's student instruction

Course Lectures

20.1-20.2 AE 251: "Aerodynamics of the Airplane" ca. 1925
[2 folders]

20.3-20.6 AE 266: "Two-Dimensional, Steady Motion of Perfect,
Incompressible Fluid" n.d. [4 folders]

20.7 Miscellaneous Course Lecture Notes ca. 1925-27

20.8 Aerology (Dr. H. Bateman) 1925

20.9 "Stress Analysis of Airplanes and Dirigibles" (Bateman) 1926

20.10 Elasticity (Bateman) 1927

Box 21

Millikan's student instruction *cont.*

Aeronautics

- 21.1 “Propeller Theories” (Bateman) Winter 1929-30
- 21.2 “Dynamical Theory of Oscillations and Vibrations”
(von Kármán) Fall 1930
- 21.3 “Applied Elasticity” (von Kármán) Spring 1930
- 21.4 “Dynamic Meteorology” (Rossby) 1934
- 21.5 “Turbulence in the Atmosphere” (Rossby) Spring 1938
- 21.6 “Airplane Design” (Raymond) n.d.

German

- 21.7 Scientific German n.d.

Mathematics

- 21.8 “Vector Analysis” (Bateman) Fall 1925
- 21.9 “Differential Equations” (H. Hicks) Winter 1925
- 21.10 “Sophomore Calculus” (problems and notes) Spring
1925
- 21.11 “Freshman Math” 1925
- 21.12 “Sophomore Calculus” 1926
- 21.13 “Mathematical Analysis” (Bell) 1926-27

Box 22

- 22.1 “Mathematical Analysis II” (Bell) 1927
 - 22.2 “Modern Analysis” (Whittaker and Watson)
Summer 1927
 - 22.3 “Applied Mathematics” (von Kármán) Spring 1932
- Physics
- 22.4 “Thermodynamics and Light Scattering” (C. V. Raman)
Fall 1924
 - 22.5 “Thermodynamics” (P. S. Epstein) Fall 1925
 - 22.6 “Electron Theory” (R. A. Millikan) Winter 1925
 - 22.7 “Higher Dynamics” (Epstein) 1925
 - 22.8 “Electricity and Magnetism” (Epstein) Fall 1926
 - 22.9 “Quantum Theory of Atomic Structure” (Epstein)
Spring 1926
 - 22.10 “Electromagnetic Waves” (Epstein) Winter 1927
 - 22.11 “Introduction to Relativity” (R. C. Tolman) Spring 1927
 - 22.12 “Modern Quantum Theory of Atomic Structure”
(Epstein) Spring 1927
 - 22.13 “Mathematical Physics” (Loria) n.d.

Box 23

Undergraduate Physics

- 23.1 Report on Junior Honor Physics work 1922-23
- 23.2 "Kinetic Theory of Gases" (Uhler) 1923
- 23.3 "Introduction to Theoretical Mechanics" (E. W. Brown)
1923-24
- 23.4 "Sophomore Physics" (Uhler) n.d.

SERIES V: WRITINGS

A LECTURES, SPEECHES, SEMINARS

Box 23 cont.

- 23.5 Lectures, speeches, seminars Nov 1926-Nov 1929
 - Speech for CIT Alumni Nov 12, 1926
 - Lecture on aeronautics to Hollywood High School Science Club
Oct 26, 1927
 - "Simple Theory of Flight and Recent Developments in
Aeronautics at the Institute" Mar 30, 1928
 - Three lectures on Elementary Theory of Flow Apr 1928
 - "Research in Aeronautics and the Guggenheim School at the
California Institute of Technology" Sep 12, 1928
 - Talk on aeronautics to Faculty Women's Club Nov 7, 1928
 - "Aeronautical Research" Dec 1928
 - "Early History of Aeronautical Education in the United States"
Nov 25, 1929
- 23.6 Lectures, speeches, seminars Apr 1930-Dec 1930
 - "Dryden's Turbulence Investigation With Hot Wire
Animometer" (seminar) Apr 16, 1930
 - "Preliminary Researches on Boundary Layer About Body With
Axial Symmetry" (seminar) Dec 30, 1930
- 23.7 Lectures, speeches, seminars Oct 1931-Nov 1931
 - "Body-Wing Interference" (seminar) Oct 7, 1931
 - "Airship Stability" (seminar) Nov 18, 1931
- 23.8 Lectures, speeches, seminars Feb 1932-May 1934
 - "The Elementary Principles of Flight" Feb 5, 1932
 - Yale Club talk Sep 7, 1934 R. R. lecture May 11, 1934

- “On the Results of Aerodynamic Research and their Application to Aircraft Construction”
- 23.9 Manuscript (with German translation) ca. 1936
- 23.10 Correspondence *re* 1936
- 23.11 “The Physicist Gets Air minded” (including correspondence *re*) Oct 1936
- 23.12 Seminar: Wind tunnel distortion Feb 16, 1937
- Box 24**
- 24.1 “The Influence of Running Propellers on Airplane Characteristics” Dec 21, 1939
- 24.2 “The Influence of Running Propellers on Airplane Characteristics”: correspondence *re*) 1939
- 24.3 Lectures, speeches, seminars Jan 1940-May 1943
- “Recent Developments in Civil and Military Aviation” Jan 16, 1940
- “Some Research Problems of Current Aeronautic Interest” Jan 30, 1940
- Current problems in Aeronautics (notes only) n.d.
- “Aviation in the Emergency” Apr 29, 1941
- Toastmaster notes, von Kármán 60th birthday dinner May 1941
- “Aviation and the War” May 26, 1942
- “Present Trends in Aircraft Design” May 12, 1943
- 24.4 Lectures, speeches, seminars Sep 1943-Sep 1945
- Talk to Los Angeles Chamber of Commerce Committee Sep 1, 1943
- I.Ae.S. San Diego section lecture Apr 7, 1944
- “Activities of GALCIT in Cooperation with Aircraft Industry” Apr 16, 1944
- Jet-Assisted Take-off and Super-performance Jun 1, 1944
- SAE student branch talk Sep 25, 1944
- Correspondence *re*
- ASME meeting Aug 21, 1945
- German Technical mission Sep 13, 1945
- Correspondence *re*
- 24.5 Lectures, speeches, seminars May 1946-May 1947
- “Guided Missiles” May 1946
- ORDCIT history and program Jun 13, 1946
- Talk to visitors Nov 4, 1946
- Research and Development for National Defense Nov 11, 1946

- “Current Researches in Aerodynamics and Structures” Dec 1946
 - “Current Research in Aeronautics” Dec 28, 1946
 - “Faster and Faster: How and Why” Feb 28, 1947
 - Army Ordnance Association May 13, 1947
- 24.6 Lectures, speeches, seminars Dec 1947-Jan 1951
 - “Recent Advances in Supersonic Flight” Dec 12, 1947
 - Cooperative Wind Tunnel (CWT) lecture Mar 4, 1948
 - Remarks from California Air Policy Conference Apr 15, 1948
 - CWT: El Toro lecture Jun 1, 1948
 - “Dawn of the Supersonic Age” Aug 31, 1948
 - Talk to CIT Associates Jan 1949
 - “Activities of the California Institute of Technology Toward the National Defense Effort” Apr 26, 1949
 - “Dawn of the Supersonic Age” Sep 2, 1949
 - “Dawn of the Supersonic Age” Sep 12, 1949
 - Remarks on the GALCIT Hypersonic Wind Tunnel Nov 1, 1949
 - CWT Christmas party speech December 1949
 - “Cal Tech and the Supersonic Age” Jun 7, 1950
 - Memorial dedication of Merrill Wind Aug 31, 1950
 - Introduction for Dr. William Bollay Jan 4, 1951
 - “The Guided Missile: Precocious Problem Child of the Military Act”
- 24.7 Manuscript Mar 13, 1951
- 24.8 Background material ca. 1951
- 24.9 Lectures, speeches, seminars Jan 1952-Dec 1955
 - I.Ae.S. Honors Dinner May 3, 1952 CWT talk to foreign visitors Jan 28, 1952
 - “Some Non-classified Comments on the Guided Missile Program” Sep 25, 1952
 - “Problem of Science and Especially Scientists in National Defense” Jun 13, 1954
 - Dinner talk, American Physics Society Nov 23, 1954
 - “Problems of S.S. Flight” Feb 1955
 - CWT talk and comments Jul 1955
 - CWT talk Oct 27, 1955
 - “50 Years of Aerodynamic Science” Dec 3, 1955
 - Wright Brothers lecture Dec 20, 1955
 - CWT talk (Christmas party) Dec 1955
- 24.10 Lectures, speeches, seminars Mar 1956-Jun 1957
 - CWT talk to CIT trustees Mar 5, 1956

- Minta Martin lecture Mar 26, 1956
CWT dance talk Apr 28, 1956
MIT Seminar: "Fashions in Aeronautics Curricula and Researches" Mar 1957
"The Revolution of the Last Decade in Aeronautics" Apr 6, 1957
CWT talk May 18, 1957
"Revolution in the Air" May 29, 1957
Correspondence *re* 1957
"Reflections on the First Quarter Century of the I.Ae.S." Jun 17, 1957
- 24.11 "Advanced Education and Academic Research in Aeronautics" Sep 13, 1957
24.12 Correspondence *re* 1957
24.13 Background material ca. 1957
- Box 25**
- 25.1 "Advanced Education and Academic Research in Aeronautics": miscellaneous background material 1957
25.2 Lectures, speeches and seminars Dec 1957-Aug 1960
"Some Current Aeronautical Activities in Europe" Dec 13, 1957
"The New Look in Aeronautical Fluid Mechanics" Apr 1958
"Space Travel and the Revolution in Aeronautical Science" Jun 27, 1958; May 1958
CWT Dinner Dance Talk May 9, 1959
"Missile and Space Gaps" Mar 7 & 26, 1960
"The New Look in Aerospace Research and Development" Aug 18, 1960
25.3 "What to do with Space" Mar 28, 1962; Mar 7, 1963
25.4 Correspondence *re* 1962-63
25.5 Miscellaneous background material 1962-63
25.6 Lectures, speeches and seminars Nov 1962-Jan 1964
"Aeronautics at CalTech as of 1962" Nov 5, 1962
Introduction for M. J. Lighthill at Wright Brothers lecture Jan 31, 1963
R[obert] A. M[illikan] panel discussion Jan 5, 1964
Saul Kaplan eulogy Feb 27, 1964
"What to do with Space" Jun 1964
Introduction for John Stacts (largely autobiographical) Jul 14, 1964

- Seminar in national security Jan 20, 1965
- 25.7 Seminar/lecture: "Rockets Applied to Assisted Take-Off and Super-performance" n.d.
- 25.8 Radio broadcasts (includes correspondence *re*) 1937-57
- 25.9 TV broadcast: "Deeper, Faster, Hotter and Higher" Dec 1958

B: PAPERS, ARTICLES, REPRINTS

Box 26

- 26.1-26.2 "Some Problems in the Steady Motion of Viscous, Incompressible Fluids; With Particular Reference to a Variation Principle" (PhD thesis) 1928 [2 folders]
- 26.3 "Aeronautics at the California Institute of Technology" Nov 1928
- 26.4 "Further Experiments on the Variation on Maximum Lift Coefficient With Turbulence and Reynolds' Number" May 1933
- 26.5 "The Boundary Layer and Skin Friction for a Figure of Revolution" 1932
- 26.6 "On the Lift Distribution for a Wing of Arbitrary Plan Form in a Circular Wind Tunnel" and bibliography 1932
- 26.7 "On the Maximum Lift Coefficient and the State of Turbulence in Wind Tunnels and the Free Atmosphere" (with A. L. Klein) June 1933
- 26.8 "A Theoretical Calculation of the Laminar Boundary Layer Around an Elliptic Cylinder, and its Comparison with Experiment" 1935
- 26.9 "A Theoretical Investigation of the Maximum Coefficient" (with von Kármán) 1935
- 26.10 "On the Stalling of Highly Tapered Wings" 1939
- 26.11 "The Influence of Running Propellers On Airplane Characteristics" Jan 1940
- 26.12 "Theodore von Kármán – an Appreciation" 1941
- 26.13 "The Guided Missile – Problem Child" 1951
- "Design Trends – Guided Missiles"
- 26.14 Reprint Dec 1953
- 26.15 Background material 1953
- 26.16 "Theodore von Kármán" May 1956
- 26.17 "Advanced Education and Academic Research in Aeronautics" 1957
- 26.18 "The New Look in Aerospace Research and Development" Oct 1960
- 26.19 "What to Do With Space" Spring 1963
- 26.20 "Theodore von Kármán: his American Period" 1963
- 26.21 "On the Theory of Laminar Boundary Layers Involving Separation" (with von Kármán) 1934
- 26.22 "Airplane Performance" (incomplete) n.d.

Box 27

- 27.1 "Performance" book: manuscript (incomplete), background material and correspondence n.d.
- "Wind Tunnel Test on a High Wing Monoplane with Running Propeller"
- 27.2 Manuscript paper ca. 1935
- 27.3 Correspondence *re* 1935
- "An Extended Theory of Thin Airfoils and its Application to the Biplane Problem"
- 27.4 Manuscript ca. 1935
- 27.5 Correspondence *re* 1935
- 27.6 "The Present Status of the Problem of the Airfoil With Hinged Flap ca.1929
- 27.7 "Some Elements of Performance From the View- point of the Theory of Induced Drag" ca. 1930
- "On the Theory of Laminar Boundary Layers Involving Separation"
- 27.8 Manuscript ca. 1933-34
- 27.9 Correspondence *re* 1933-34
- 27.10 "The Use of the Wind Tunnel in Connection With Aircraft Design Problems" (with von Kármán) 1934
- 27.11 Miscellaneous reprints 1929-38
 - "On the Steady Motion of Viscous, Incompressible Fluids" 1929
 - "Logarithmic Spiral Flow of an Incompressible Fluid" 1929
 - "On the Results of Aerodynamic Research and their Application to Aircraft Construction" (with German translation) 1936
 - "The Physicist Gets Air-minded" 1936
 - "A Critical Discussion of Turbulent Flows in Channels and Circular Tubes" 1938

SERIES VI: RESEARCH AND TECHNICAL FILES

A. REPRINTS AND PREPRINTS**Box 28**

- 28.1 Alexandrow, W. n.d.
- 28.2 Allen, Edmund T. (includes notes by CBM) 1942
- 28.3 Alsop, Stewart 1962
- 28.4 Alter, Dinsmore n.d.
- 28.5 Ashworth, T., Lt., U.S.N.; and Dilworth, J. A., 2nd Lt., U.S. Army, Eng. Res. 1941
- 28.6 Bateman, H. 1917-27
- 28.7 Bell, Richard W. and Storms, Harrison, A., Jr. 1941
- 28.8 Biermann, David 1937
- 28.9 Biermann, David and Hartman, Edwin P. n.d.
- 28.10 Bush, Vannevar 1955
- 28.11 Courant-Hilbert n.d.
- 28.12 Donnell, L. H. n.d.
- 28.13 Dryden, Hugh L. 1948
- 28.14 Epstein, P. S. 1922
- 28.15 Goetz, A. 1929
- 28.16 Goetz, A. and Haster, Maurice F. 1929
- 28.17 Hatton, George A., Lt., U.S.N. 1940
- 28.18 Hawkes, Russell 1960

Box 29

- 29.1 Hood, Manly J. n.d.
- 29.2 Jacobs, Eastman N. (correspondence and discussion by CBM) 1933-34
- 29.3 Katz, Amrom H. 1964
- 29.4 Klein, A. L. 1925
- 29.5 Klemin, Alexander 1934
- 29.6 Kármán-Millikan book (incomplete) 1930
- 29.7 Langer, R. M. 1926-29
- 29.8 Lorentz, H. A. 1926
- 29.9 Merwin, Davis 1958
- 29.10 Millikan, R. A. and Cameron, G. H. 1926

- 29.11 Minshall, Robert James and Farquharson, Frederick Burt 1924
- 29.12-29.14 Miscellaneous ca. 1928-64 [3 folders]
- 29.15 Neher, H. V. 1968
- 29.16 Oppenheimer, J. R. 1930
- 29.17 Oswald, W. Baily 1933
- 29.18 Pekeris, C. L. 1932
- 29.19 Price, Don K. 1962
- 29.20 Ruffner, Benjamin 1932
- 29.21 Rumph, C. B., Jr. and Schairer, Robert 1940
- 29.22 Schubauer, G. B. 1935

Box 30

- 30.1 Stout, Ernest G. 1940
- 30.2 Thomas, Tracy Yerkes 1930
- 30.3 Uhler, H. S. 1923
- 30.4 Uhler, H. S. and Browning, Philip 1916
- 30.5 Uhler, H. S. and Tanch, J. W. 1922
- 30.6 von Kármán, Theodore 1945-47
- 30.7 von Kármán, Theodore; Sechler, Ernest E; and Donnell, L. H. ca. 1930
- 30.8 Ward, Morgan 1928
- 30.9 Wolfe, Dael 1957
- 30.10 Zwicky, F. 1929-30

B. RESEARCH AND TECHNICAL DOCUMENTS**Box 30 cont.**

- 30.11 Aerodynamics, general n.d.
- 30.12 Aeronautics: translations ca. 1924-25
- Airfoil
- 30.13 Characteristics n.d.
- 30.14-30.15 Theory n.d. [2 folders]
- 30.16 Aviation: bibliography and research problems n.d.
- Biplane theory
- 30.17 Charts and calculations n.d.
- 30.18 Correspondence, literature 1919-29

Box 31

- Biplane theory *cont.*
 Theory-experiment comparison n.d.
- 31.1 pp. 1-150
 - 31.2 pp. 151-400
 - 31.3 Translations ca. 1910s
- Boundary Layer ca. 1920s
- 31.4 Comprehensive notes
 - 31.5 Jaukowsky Theory
 - 31.6 Kármán-Mises Theory
 - 31.7 “Roof” profiles
 - 31.8 Correspondence 1937

Box 32

- 32.1 Dynamic Meteorology n.d.
 - 32.2 Flutter Investigation of Tail Planes n.d.
 - 32.3 General Relativity n.d.
- German Aviation
- 32.4 Printed matter from German trip 1936
 - 32.5 “Report of Observations of German Aviation” Oct 1936
 - 32.6 Gruschwitz Method n.d.
 - 32.7 Jaukowsky Transformations n.d.
 - 32.8 Lattice Theory n.d.
 - 32.9 Lees Heat Transfers n.d.
- Mathematics
- 32.10 Convenient vector-curvilinear transformations n.d.
 - 32.11 General curvilinear coordinates 1950
 - 32.12 Miscellaneous mathematical proofs and notes ca. 1928
 - 32.13 Osgood Theory n.d.
 - 32.14 Slavarty-Christofel Green Function for Straight Lines n.d.
 - 32.15 “Milan II”: notes and drawings ca. 1925
 - 32.16 Miscellaneous tables and charts ca. 1929-33
- Performance
- 32.17 Analysis ca. 1929-37
 - 32.18 Charts 1930s
 - 32.19 Correspondence 1929-37
 - 32.20 Formulæ ca. 1929-30

Box 33

- 33.1 Ph.D. notes ca. 1920s
Porpoising
Data and calculations
- 33.2 1930s
- 33.3 ca. 1941
- 33.4 Correspondence 1940-41
Power Effects
- 33.5 1938
- 33.6 1944-45
- 33.7 Propellers n.d.
Reports
- 33.8 Douglas Aircraft 1933
- 33.9 GALCIT 1934, 1945
- 33.10 Air Corps; Douglas Aircraft 1934-36
- 33.11 Douglas Aircraft; Lockheed 1934
- 33.12 Roughness Data 1937
- 33.13 Theodorson: Theory of Wing Sections of Arbitrary Shape n.d.
- 33.14 Turbulence n.d.
- 33.15 Wake Survey Drag Determination 1937

C: INDUSTRIAL RELATIONS: CORRESPONDENCE AND DOCUMENTS

Box 34

- 34.1 Aero Engineering Corporation 1935-38
- 34.2 Airplane Companies 1946-49
- 34.3 Brazilian Aeronautical Commission 1946
- 34.4 Fairchild Engine and Airplane Corporation 1947
- 34.5 General Electric Company 1935
- 34.6 Industrial Associates (Caltech) 1962-65

E. PHOTOGRAPHIC SLIDES

Box 34 cont.

- 34.7 "A": Low-speed Aerodynamics
- 34.8 "B": Statistical Theory of Turbulence
- 34.9 "D": Transonic Flow
- 34.10 "F": Inviscid Hypersonic Flow
- 34.11 "G": Hypersonic Boundary Layer

34.12	“H”: Compressible Boundary Layer Heat Transfer
34.13	“L”: Newtonian Flow
34.14	“M”: Dynamics of Rarefied Gases
34.15	Slides “1-21”

SERIES VII: BIOGRAPHICAL AND PERSONAL

Box 35

Diaries

35.1	1940
35.2	1941
35.3	1942
35.4	1943
35.5	1944
35.6	1945
35.7	1946
35.8	1947
35.9	1948
35.10	1949
35.11	1950

Box 36

Diaries *cont.*

36.1	1951
36.2	1952
36.3	1953
36.4	1954
36.5	1955
36.6	1956
36.7	1957
36.8	1958
36.9	1959
36.10	1960
36.11	1961
36.12	1962

36.13	1963
36.14	1964
36.15	1965

Box 37

	Personal scrapbooks
37.1	1956
37.2	1957
37.3	1958
37.4	1959
37.5	1960
37.6	1961
37.7	1962
37.8	1963
37.9	1964
37.10-37.11	News clippings 1920s-40s [2 folders]
	Flying
37.12	General 1935-41
37.13	Biographical and personal 1930s
37.14	British Excursion 1957

Box 38

	Clubs and Associations
	Bohemian Club
	Correspondence
38.1	1958-64
38.2	1962-65
38.3	Printed matter 1961-65
38.4	California Club 1944, 1954, 1965
38.5	Parties, events, dinners etc. 1937-61
	Phelps Association
38.6	Correspondence 1952-65
38.7	Printed matter 1959-64
38.8	Politics (Republican Party) 1961-65
38.9	Sunset Club 1946-65
38.10	Twilight Club 1959-60
38.11	Yale Club 1956-65

Box 39

- Millikan family correspondence
- 39.1 Edith Parry (second wife) 1956-59
- 39.2 Helen Staats (first wife) 1958-60
- 39.3 Max (brother) 1958-65
- 39.4 Michael (son) 1955-61
- 39.5 Miscellaneous 1943-60
- Finances
- 39.6 Financial statements 1962-65
- Investments
- 39.7 Hotel Cabo San Lucas 1961-64
- 39.8 National Engineering Science Co. 1958-65
- 39.9 Robert A. Millikan Estate 1961
- 39.10 Jury Duty 1961-62
- 39.11 Medical Records 1963-65
- 39.12 "In Memoriam," *Engineering and Science* January 1966