

Geophysical Laboratory General Files, 1900-Present



**Carnegie Institution of Washington
Geophysical Laboratory Archives
Washington, DC**

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GL-2005-01

Introduction

Abstract: This collection contains the records of the Geophysical Laboratory (GL) at the Carnegie Institution of Washington (CIW), established in 1905, continuing to the present. The collection documents field and laboratory operations of GL, in particular its hallmark programs in igneous petrology, volcanology, geochemistry, and high-pressure research.

Extent: 35 linear feet; 21 file drawers, 12 map case folders.

Acquisition: The records have been in the possession of the Geophysical Laboratory (GL) since their creation.

Access Restrictions: There are no access restrictions to this collection.

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Processing: This collection was processed by Jennifer Snyder and Ann Mulfort in September 2005 through the generous support of the National Historical Publications and Records Commission.

During the processing of this collection, many file groupings were discovered – some disorganized and fragmentary. The most coherent body of records consisted of two parallel, alphabetical sequences referred to simply as “GL Files” and “GL General Files.” No clear distinction could be ascertained, as the two sequences overlapped both chronologically and topically, and lacked explicit provenance. For ease of use, these were combined into a single alphabet as Series 1, Alphabetical Files. Files of internal correspondence (i.e., between GL and Carnegie Institution headquarters) were historically maintained separately from the first two file groups. This distinction was recognized in establishing them as Series 2, Administrative Files.

Records judged to be of historical significance to the Laboratory and meriting permanent retention were placed in Series 3, Archives Files. These latter records include both primary source materials (e.g., blueprints, field notebooks, visitor logs) and secondary materials (e.g., published biographies, discipline histories). The arrangement parallels that of the General Files of the Department of Terrestrial Magnetism.

Historical Note

The Geophysical Laboratory was officially established by the Trustees of the Carnegie Institution in December, 1905. Construction of a state-of-the-art research building in

Washington, D.C. began the following year, and in 1907 the new Laboratory opened under the direction of Arthur L. Day. According to the brief history published in the Laboratory's 1999 descriptive booklet:

Day's goals were to duplicate the pressures and temperatures of the Earth's crust in the laboratory and to study the structure and behavior of minerals at successive stages of depth. The pressures the scientists were able to obtain were tremendous for the time—up to 2000 atmospheres, or 30,000 pounds per square inch. Within a decade, the Laboratory had made significant contributions to the understanding of the Earth's crust. In addition, it developed improved forms of optical glass, initiated work that was instrumental to the invention of the revolutionary glass Pyrex, and conducted research that solved fundamental problems in the Portland cement industry.

During the 1910s and 20s, Day began programs in volcanology and seismology. Norman Bowen's classic work in fractional crystallization was also a product of this era. In the 1930s, under the second director Leason Adams, the Lab became involved in pioneering studies in radioactivity with DTM. Throughout the 1930s and 40s, the Lab's scientists continued to make important contributions to high-pressure research and were at the forefront of igneous and metamorphic petrology.

Philip Abelson, the Laboratory's third director (1953-1971), broadened the scope of the facility to include investigations into the organic processes inside the Earth. These studies eventually coalesced into the current program of biogeochemistry. Under the directors Hatten Yoder, Jr. (1971-1986) and Charles Prewitt (1986-1998), the Lab's high-pressure scientists were able to reach some of the greatest pressures ever attained, and, at the same time, new investigations were undertaken into primitive life. Since the 1970s the Lab has been on the leading edge of research in mineral physics and crystallography.

Please see the appended timeline of significant GL achievements.

A chronology of the directorships of the Laboratory is as follows:

- Arthur L. Day (1909-1918)
- Robert B. Sosman, Acting Director (1918-1920)
- Arthur L. Day (1920-1936)
- Leason H. Adams, Acting Director (1936-1937); Director (1938-1952)
- George W. Morey, Acting Director (1952-1953)
- Philip H. Abelson (1953-1971)
- Hatten S. Yoder, Jr. (1971-1986)
- Charles T. Prewitt (1986-1998)
- Wesley T. Huntress, Jr. (1998-)

Scope and Content

This collection contains the records of the Geophysical Laboratory (GL) at the Carnegie Institution of Washington, established in 1905. It contains directors' correspondence; site and building plans; field notes; drawings of equipment and apparatus; photographs; news clippings; biographical files; project records; and visitor logs. Records document field and laboratory operations of GL, in particular its hallmark programs in igneous petrology, volcanology, geochemistry, and high-pressure research. Other programs of research, conducted for varying periods of time (some still active at present) include: seismology; thermodynamics; x-ray crystallography; mineral physics; and astrobiology. The collection also documents defense research undertaken by GL personnel during World War I and II.

Arrangement

This collection is arranged in three series.

Series 1: Alphabetical Files, 1900-1953

Series 2: Administrative Files, 1908-1995 (Bulk 1921-1987)

Series 3: Archives Files, 1904-Present

Series 1: Alphabetical Files, 1900-1953

This inactive series contains the correspondence of the director's office, as well as correspondence of other staff members pertaining to the procurement of laboratory supplies and scientific specimens, services, conferences, publications, etc. Folders are organized alphabetically by the name of the correspondent (including individuals, research institutes, universities, government agencies, publishers, companies, and societies) or meeting name. Among the eminent scientists represented are American volcanologists Frank A. Perret (1867-1943) and Thomas A. Jaggar (1871-1953). Also included are internal memoranda and reports, filed under subject headings such as "Contracts," "Instruments," "Kilauea Volcano," "Lassen Peak," "Notices," "Optical glass," and "X-ray."

Series 2: Administrative Files, 1908-1995 (Bulk 1921-1987)

This series consists of internal correspondence between the Geophysical Laboratory and Carnegie Institution administrators: presidents, vice-presidents, executive officers, editors, publications directors, and bursars. Well represented is the correspondence between the directors of the Laboratory and CIW presidents John C. Merriam, Vannevar Bush, Philip H. Abelson, and James D. Ebert. Also included are files dealing with Institution-wide committees and advisory groups. A folder titled "Contracts" contains records of defense research projects conducted by GL under government contracts during World War II. Folders are organized alphabetically.

Series 3: Archives Files, 1904-Present

This active series contains correspondence, photographs, maps, blueprints, news clippings, internal reports, project files, historical and biographical articles. The records document topics of historical significance to the Laboratory: the construction and operation of its facilities, research programs, conferences, expeditions, and personnel. Of particular interest are field notes from the Laboratory's expedition to the Valley of Ten Thousand Smokes (1919) and studies at Yellowstone National Park (1928-1934); minutes of the meetings of the Petrologists' Club

(1910-1965), a Washington-area scientific society; and an album of geologists' autographs collected in the 1890s by Henry S. Washington. Materials continue to be added to this series. Folders are organized alphabetically.

Folder Listing

Please see the GL General Files database for a complete folder listing. There is also a printout of the folder titles in the collection's control file. Please inquire with the archivist for access to the printed list.

Subject Terms

Topics:

- Geochemistry
- Geology--Yellowstone National Park
- Geophysics
- High pressure (Science)
- Laboratories
- Petrology
- Scientific expeditions
- Scientific instruments and apparatus
- Ten Thousand Smokes, Valley of (Alaska)
- Volcanoes

Corporate Names:

- Carnegie Institution of Washington. Geophysical Laboratory
- Petrologists' Club (Washington, D.C.)

Personal Names:

- Adams, Leason Heberling, 1887-1969
- Day, Arthur L. (Arthur Louis), 1869-1960
- Jaggar, Thomas Augustus, 1871-1953
- Perret, Frank A. (Frank Alvord), 1867-1943
- Washington, Henry S. (Henry Stephens), b. 1867

Forms:

- Administrative records
- Blueprints
- Clippings
- Correspondence
- Field notes
- Maps
- Photographs
- Plans (drawings)
- Scrapbooks
- Site plans

Visitors' books

Bibliography

Carnegie Institution: Geophysical Laboratory [descriptive booklet]. Washington, D.C.: CIW, 1999.

Trefil, James and Margaret Hindle Hazen. *Good Seeing: A Century of Science at the Carnegie Institution of Washington, 1902-2002*. Washington, D.C.: Joseph Henry Press, 2002.

Yoder, Hatten S., Jr. *The Geophysical Laboratory*. Vol. 3 of *Centennial History of the Carnegie Institution of Washington*. 5 vols. Cambridge: Cambridge University Press, 2004.

Timeline of Selected Events and Achievements at the Geophysical Laboratory

Compiled by Jennifer L. Smith and Shaun Hardy in 2005 for the GL Centennial

- 1901, November 16 - Daniel C. Gilman and John S. Billings meet with Andrew Carnegie and change the emphasis for Carnegie's proposed new institution funding from education to research and postgraduate training.
- 1901, December 2 - A gift of ten million dollars for a scientific institution in Washington, D.C. is officially announced at a lunch featuring Andrew Carnegie, President Theodore Roosevelt, Daniel C. Gilman, and Charles D. Walcott.
- 1901, December 16 - George F. Becker delivers an outline entitled "Concerning the Geophysical Laboratory" to Charles D. Walcott.
- 1902, January 4 - The Carnegie Institution of Washington is incorporated.
- 1902, January 29 - The first meeting of the Board of Trustees takes place; Gilman is elected president and Walcott, secretary.
- 1902, January 30 - The first meeting of the Executive Committee is held.
- 1902, March 21 - Becker revises and submits the expanded geophysical program to the Board of Trustees.
- 1902, September 23 - The Advisory Committee on Geophysics for Carnegie Institution of Washington (T. C. Chamberlin, C. R. Van Hise, C. D. Walcott, R. S. Woodward, C. Barus, and A. A. Michelson) submits a list of sixteen specific problems in geophysics deserving study; Trustees ask Van Hise to investigate further.
- 1902 - H. S. Washington details the newly created CIPW system for classifying igneous rocks in a series of articles in the Journal of Geology.
- 1903, October 10 - The "Committee of Eight" (W. Cross, J. P. Iddings, L. V. Pirsson, H. S. Washington, F. D. Adams, J. F. Kemp, A. C. Lane, and J. E. Wolff) submits a report on the initial program of research for the geophysical laboratory.
- 1903 - F. A. Perret begins a series of observations at Mount Vesuvius.
- 1903 - H. S. Washington publishes Chemical Analyses of Igneous Rocks.
- 1904, January - Detailed proposals for the Laboratory's staff, building design, budget, and organization by the "Committee of Eight," Van Hise, and Becker are published in Year Book No. 2.
- 1904 - R. S. Woodward succeeds Gilman as president of the Carnegie Institution of Washington.
- 1905, December 12 - After persuasion from Woodward and Walcott, the Geophysical Laboratory is officially established at the meeting of the Trustees; \$150,000 approved for land and construction.
- 1905 - The work of A. L. Day, E. T. Allen, and J. P. Iddings on the plagioclase feldspars becomes the first official publication of the Geophysical Laboratory.
- 1906, March 17 - Land at Upton Street in Northwest Washington, D.C. is bought for the Geophysical Laboratory site; Wood, Donn, and Deming are selected architects for the design.
- 1906, June - Excavation on the site begins.
- 1906, July 6 - Construction contract is let to Richardson and Burgess, Inc. of Washington, D.C.
- 1907, January - Arthur L. Day is officially named the first director of the Geophysical Laboratory, though he had already been de facto director for several months.
- 1907, June - Construction is completed and the first scientists move into the Geophysical Laboratory months before the anticipated occupation date.

- 1908 - E. T. Allen and J. K. Clement carry out the first hydrothermal studies at GL on the role of water in tremolite.
- 1909 - E. S. Shepherd, G. A. Rankin, and F. E. Wright develop the quenching method for petrological study.
- 1909 - Andrew Carnegie adds two million dollars to the endowment.
- 1910 - N. L. Bowen arrives at GL as a pre-doctoral student from MIT.
- 1911 - The Hawaiian Volcano Observatory is founded by Massachusetts Institute of Technology's T. A. Jaggar with collaboration from Harvard's R. A. Daly, the Volcano Research Association of Hawaii, and the Geophysical Laboratory.
- 1911 - J. Johnston and L. H. Adams report the melting point changes with high pressure of Sn, Bi, Cd, and Pb.
- 1911 - Andrew Carnegie supplies the Carnegie Institution of Washington with another ten million dollars of support.
- 1911-1912 - A. L. Day and E. S. Shepherd collect and analyze the gases in the active part of the Halema'uma'u crater of Kilauea.
- 1912 - A. L. Day and H. S. Washington study active volcanoes in the Mediterranean.
- 1912 - J. Johnston and L. H. Adams attempt to measure the thermal gradient in the crust with mercury thermometers and an electrical resistance thermometer in wells near Charleston, WV.
- 1914 - H. S. Washington describes fumaroles, their colored accumulations of salts, and the variety of emitted gases from Mount Vesuvius's crater.
- 1915 - N. L. Bowen proves that the gravitative settling of crystals is a viable mechanism for differentiation.
- 1916 - R. E. Griggs leads the first scientific expedition to Katmai, Alaska after the great eruption.
- 1917, March 28 - A. L. Day introduces a plan to investigate the wartime optical glass shortage to President Woodward of CIW.
- 1917 - The Carnegie Institution of Washington, with partner Bausch and Lomb Optical Company, produce close to 40,000 pounds of government-accepted American-made optical glass per month to aid the war-time effort; GL supervised the glass-making efforts.
- 1917 - A. L. Day and E. S. Shepard prove that water was an original part of the lava at Kilauea.
- 1918 - Erskine D. Williamson becomes the first to use the term "chemical potential" in a paper with G. W. Morey.
- 1918-1920 - A. L. Day takes a leave of absence from the directorship of GL to serve as the vice president of Corning Glass Works.
- 1919 - W. P. White and L. H. Adams develop a method for constant temperature in an electric furnace.
- 1919 - The crystal structure determination program begins at GL under Ralph W. G. Wyckoff.
- 1921, March 10 - The Board of Trustees authorize the formation of an Advisory Committee in Seismology; A. L. Day is appointed Chairman.
- 1921 - J. D. Grant undertakes drilling at "The Geysers" in Sonoma County, California.
- 1922 - N. L. Bowen publishes "The reaction principle in petrogenesis."
- 1922 - Pentti Eskola describes the sequence of metamorphic rocks at a limestone-granite contact.
- 1922 - G. W. Morey devises a new theory for the rise in pressure of a cooling hydrous magma.
- 1922 - R. W. G. Wyckoff and Eugene Posnjak prove Werner's Coordination Theory, which before then was merely a hypothesis.

- 1923 - G. W. Morey demonstrates the superiority of the quenching method over the heating method for studies of silicates.
- 1923 - L. H. Adams and E. D. Williamson deduce a formula that relates the compressibility and density of rocks to seismic wave velocities and compute the probable density of the Earth's interior.
- 1923 - L. H. Adams proposes using artificial earthquakes to study the earth's interior.
- 1923 - Ralph Anderson and Harry Wood invent a new and simpler seismometer.
- 1923 - Erskine D. Williamson and L. H. Adams declare the earth's core to be metallic and made of iron or iron-nickel, with a diameter of half the earth.
- 1924 - The Carnegie Institution of Washington publishes F. A. Perret's monograph, *The Vesuvius Eruption of 1906*, with complementary photos by A. L. Day and chemical analyses of lava by H. S. Washington.
- 1925 - G. W. Morey and N. L. Bowen publish the phase relations for commercial soda-lime-silica glasses.
- 1925 - R. W. G. Wyckoff determines the first structure (high cristobalite) at high temperatures from powder x-ray-diffraction data
- 1926 - A seismology laboratory in Pasadena, California is constructed with the cooperation of California Institute of Technology.
- 1928 - F. E. Wright convinces F. A. Vening Meinesz to install his pendulum for making gravity determinations at sea on the US submarine S-21.
- 1928 - GL scientists study volcanic gases using a portable spectrograph in Java and Bali.
- 1928 - R. B. Sosman publishes the cell dimensions of spinel and other compounds of the spinel group.
- 1928 - C. N. Fenner uses new analytical methods for the determination of uranium, thorium, and lead as a basis for age calculations.
- 1928 - N. L. Bowen publishes *The Evolution of the Igneous Rocks*, the most influential book about petrology in the twentieth century.
- 1929 - C. N. Fenner and C. S. Piggot make the first calculations of a mineral's age using mass spectroscopy of lead isotopes.
- 1929-1930 - E. T. Allen, C. N. Fenner, and A. L. Day drill boreholes into the basins of Yellowstone National Park in order to develop a better understanding of underground structures, temperatures, and circulation in geyser basins.
- 1930 - CIW establishes a department of geophysics headquartered at the Seismological Laboratory in Pasadena.
- 1931 - J. W. Greig, E. S. Shepherd, and H. S. Merwin discover that granite melts at a lower temperature than basalt.
- 1931 - T. F. W. Barth and E. Posnjak describe how crystallographically equivalent sites can be occupied by chemically different atoms and publish "The spinel structure: an example of variate atom equipoints."
- 1932 - C. J. Ksanda designs the Ksanda x-ray twin gas tubes
- 1933 - Charles S. Piggot expands his radium research program to include ocean bottom sediments.
- 1933 - The Seismological Laboratory studies the Long Beach earthquake.
- 1933 - J. H. Hibben publishes detailed treatises on inorganic compounds using Raman spectroscopy.
- 1935 - E. T. Allen and A. L. Day publish *Hot Springs of the Yellowstone National Park*.

- 1935 - N. L. Bowen and J. F. Schairer determine the phase relations in the nepheline -kalsilite-quartz system.
- 1936 - Leason H. Adams is appointed second director of GL
- 1936 - C. S. Piggot publishes a description of his new powder charge driven coring device that can obtain vertical cores up to ten feet in length at depths of 2,800 fathoms.
- 1937 - The CIW seismology program is transferred to the California Institute of Technology and John P. Buwalda becomes chairman of a committee to administer the seismological laboratory.
- 1938 - G. W. Morey publishes Properties of Glass.
- 1939 - GL and the Department of Terrestrial Magnetism cooperate in an investigation of the electrical, magmatic, and other properties of the Santa Maria volcano.
- 1939 - J. H. Hibben follows up his research on inorganic compounds to include organic materials.
- 1940 - E. Posnjak publishes data indicating that the Curie temperature of ferrous sulfides rises with increasing sulfur content.
- 1940 - N. L. Bowen establishes the sequence of reactions in the progressive metamorphism of siliceous dolomite.
- 1941 - G. W. Morey designs and builds the "Morey Bomb" to study hydrothermal synthesis.
- 1941 - GL begins machine gun barrel development research during WWII; L. H. Adams is appointed Chairman of the committee.
- 1947 - O. F. Tuttle designs a new experiment set-up that allows for the separate control and measurement of pressure and temperature.
- 1947 - The DTM Lunch Club is established. GL joins when the two departments co-locate at Broad Branch Road 43 years later.
- 1947 - Statistical petrology studies at GL begin under Felix Chayes.
- 1949 - The first powder x-ray diffractometer arrives at GL.
- 1953 - Philip H. Abelson is named third director of the Geophysical Laboratory and expands the research program to include investigations into biogeochemistry.
- 1954 - F. R. Boyd, Jr. publishes the first systematic P-T studies of tremolite and pargasite.
- 1956 - "Concordia" method makes U-Pb age determinations accurate.
- 1957 - G. R. Tilton and colleagues develop the concept that oldest rocks are the nucleus of a continent and younger belts of rocks are subsequently added on.
- 1958 - Staff member Hatten S. Yoder, Jr. becomes the youngest member elected to the National Academy of Sciences at age 37.
- 1959 - Work in stable isotope mass spectrometry at GL begins under T. C. Hoering.
- 1961 - S. P. Clark, Jr. derives geotherms as a function of time for various models calculated with the aid of a digital computer.
- 1961 - H. S. Yoder, Jr. and C. E. Tilley outline the transition of basalt to eclogite.
- 1962 - Yoder and Tilley's experimental study of the origins of basaltic magmas is published.
- 1962 - B. R. Doe determines the lead isotopes of galena.
- 1963 - H. J. Greenwood first suggests the deterioration of amphibole at high pressures.
- 1968 - C. Hadidiacos designs solid-state temperature controllers and integrates them into both one-atmosphere and high-pressure types of apparatus.
- 1968 - E. Hansen develops the concept of strain facies and publishes a book on the topic.
- 1969 - Apollo missions return with first lunar samples later studied at GL.
- 1971 - Hatten S. Yoder, Jr. is named fourth director of the Geophysical Laboratory.

- 1971 - F. Chayes introduces a computer-based system for rock analysis information.
- 1973 - F. R. Boyd, Jr. applies the pyroxene geobarometer and geothermometer, and obtains a quantitative measure of the geotherm.
- ca. 1975 - Amino acid racemization technique as a practical dating tool for fossils developed by P. E. Hare and collaborators
- 1975 - Ho-kwang Mao and Peter M. Bell use a diamond anvil cell to reach pressure of 1,018,000 atmospheres.
- 1975 - R. M. Hazen and C. T. Prewitt organize the first mineral physics conference, sponsored by CIW and NSF.
- 1976 - H. S. Yoder, Jr. publishes his definitive book, *The Generation of Basaltic Magma*.
- 1976 - The Geophysical Laboratory's Pistons and the Department of Terrestrial Magnetism's Dynamos play their first soccer game. The Dynamos win, 4 - 0.
- 1977 - R. M. Hazen and C. T. Prewitt develop an empirical relationship between bond lengths and compression in oxygen-based minerals.
- 1980 - M. L. F. Estep and H. Dabrowski report how they traced food chains of a snail using the stable isotopes of hydrogen.
- 1983 - The field of mineral physics is officially recognized by the American Geophysical Union.
- 1984 - H. K. Mao and R. J. Hemley squeeze hydrogen above the 2-megabar mark.
- 1986 - Charles T. Prewitt is named fifth director of the Geophysical Laboratory.
- 1987 - GL researchers contribute to first crystallographic studies of high-temperature superconductors.
- 1988 - B. O. Mysen writes *Structure and Properties of Silicate Melts*.
- 1989 - M. Fogel and N. Tuross pioneer use of stable isotopes as dietary tracers in prehistoric people.
- 1990 - Program in theoretical minerals physics begins, with arrival of R. E. Cohen.
- 1990 - GL moves to join the Department of Terrestrial Magnetism on the Broad Branch Road campus.
- 1991 - Center for High-Pressure Research (ChiPR) established at the Geophysical Lab, SUNY Stony Brook, and Princeton with NSF funding.
- 1992 - Multi-anvil lab established to investigate Earth's deep mantle.
- 1996 - The "Mud Cup" is established to continue the soccer rivalry between the Pistons and Dynamos.
- 1996 - GL begins investigations into astrobiology.
- 1997 - The Carnegie Institution of Washington Undergraduate Intern Program in Geosciences is created.
- 1998 - Wesley T. Huntress, Jr., is appointed sixth director of the Geophysical Laboratory.
- 1998 - A joint GL and DTM team is selected to be a part of NASA's Virtual Astrobiology Institute.
- 2001 - GL and partner institutions establish High Pressure Collaborative Access Team (HPCAT), based at Argonne and Brookhaven National Laboratories.
- 2002 - J. Scott and A. Sharma demonstrate that bacteria are capable of surviving pressures exceeding 1.5 Gpa.
- 2003 - Carnegie/ DOE Alliance Center (CDAC) established for interdisciplinary high-pressure/high-temperature research
- 2005 - Very large, colorless, single-crystal diamonds synthesized at GL using new chemical vapor deposition technique