NATIONAL ACADEMY OF SCIENCES

# LEASON HEBERLING ADAMS

*1887—1969*

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*A Biographical Memoir by*

R. E. GIBSON



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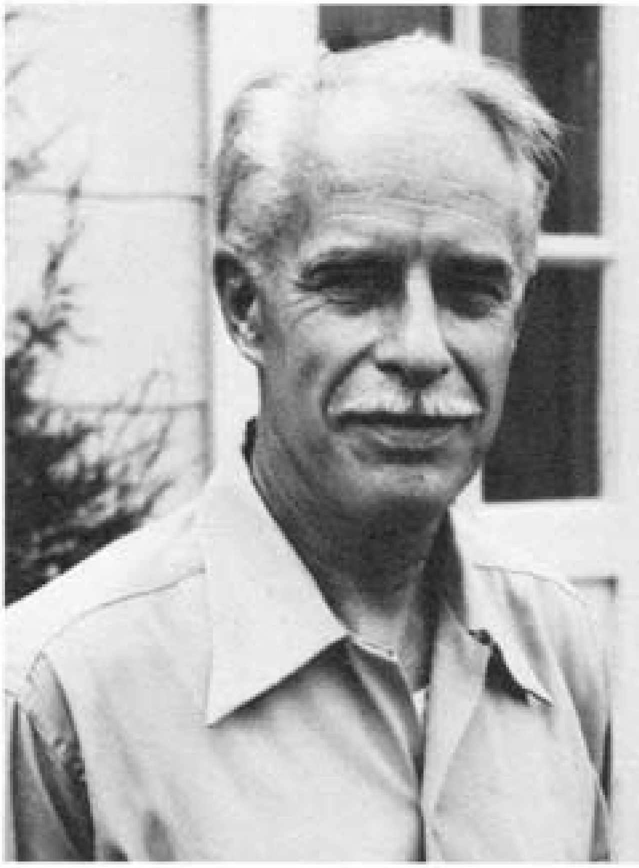

L. H. Adams

# LEASON HEBERLING ADAMS

*January 16, 1887–August 20, 1969*

BY R. E. GIBSON

LEASON HEBERLING ADAMS was born in Cherryvale, Kansas, the son of William Barton and Katherine, née Heberling, Adams. Early in his life the family moved to Taylorville in southern Illinois, where with his father, a schoolteacher, he roamed the fields and the woods, learning to observe nature and gaining self reliance. In later years he frequently spoke with great pleasure of his early experience in this part of the country.

At the age of fifteen he entered the University of Illinois, his family having moved to Champaign-Urbana, and graduated with the degree of Bachelor of Science in 1906 when he was nineteen years old. His next degree came thirty-five years later, when Tufts University conferred on him the honorary degree of Doctor of Science, in recognition of his outstanding contributions to several fields of science. In the meantime, his education had progressed at an amazing pace, for Adams was endowed not only with an insatiable curiosity, but also with the discipline, the will, and the energy to satisfy his curiosity with solid and exact knowledge. He drank deep from the Pierian Spring. For example, in his early years at the Geophysical Laboratory, he developed an interest in chemical thermodynamics. To satisfy his interest, he and several colleagues (E. D. Williamson and G. W. Morey)[1]* studied the original works of Willard Gibbs, extracting their surpassing insight and wisdom page by page, and line by line. He became an outstanding authority on chemical thermodynamics.

After graduation from Illinois, young Leason spent two years in industry, first as a chemist with Morris and Company of Chicago, and next with the Missouri Pacific Railroad Company in St. Louis. These years had a great influence on his subsequent career. They gave him a lasting immunity to the lures of industry and its rich monetary rewards, but they also cultivated in him an appreciation of the practical problems of the engineer and of the disciplined use of time and money. Throughout his career, Adams was never intimidated by the difficulties of the practical problems presented by nature—he just set about mobilizing his own intellectual resources and ingenuity to solve them.

The year 1908 was a very significant one for young Adams. On January 25 he married Jeannette Maude Blaisdell of St. Louis, beginning an affectionate and harmonious partnership, the foundation of a secure, pleasant home, long remembered by the many who tasted of its hospitality. They had four children: Leason Blaisdell, William Muirhead, Madeline Jeannette, and Ralston Heberling. Later in the year he began what proved to be a long and productive career as a research scientist in Washington, D.C., first as a member of the staff of the technological branch of the U.S. Geological Survey, and two years later as a physical chemist on the staff of the Geophysical Laboratory of the Carnegie Institution of Washington. The move was a very natural one. In 1906 the Carnegie Institution had authorized the construction, in a then rural part of the District of Columbia, of a laboratory to support and extend novel experimental investigations of the

*See Appendix for numbered footnotes.

physics and chemistry of rock formation, started by Dr. Arthur L. Day and his colleagues in the technological branch of the Survey. In July 1907 a laboratory well equipped for these investigations was open for business with A. L. Day as director, and E. T. Allen, E. S. Shepherd, Walter P. White, G. A. Rankin, F. E. Wright, and J. K. Clement as members of the scientific staff.[2]

As research associate of John Johnston,[3] Adams began research on the effects of pressure and temperature on the behavior of physicochemical systems, particularly those of geological and petrological significance, an interest which he maintained throughout all the phases of his fifty-year-long career. These were days when precise scales for the measurement of high temperature and high pressure were still undeveloped. Adams' published works of that period (1910–1920) reflect his skill and meticulousness as an experimenter. They dealt not only with effects of environmental factors on solids, but also with experimental methods for measuring pressure and temperature consistently and accurately. At the same time, his capacity for critical thought, catalyzed by Johnston's incisive mind, impelled him to take nothing for granted. The paper "On the Effect of High Pressures on the Physical and Chemical Behavior of Solids" (1913) by Johnston and Adams is a model of critical scholarship.

The entry of the United States into World War I in 1917 brought into sharp relief the astounding fact that not only did the United States depend on German and Bohemian sources for optical glass, but U.S. technology had little or no knowledge and understanding of the chemical and physical processes required to produce glass of a quality demanded by the optical instruments so important to the support of the combat army and navy. In common with all his colleagues at the Geophysical Laboratory, Adams interrupted his researches to study the "optical glass problem," focusing his attention on the physics of the annealing process. The fundamental approach taken by Adams and Williamson yielded excellent practical results that were adopted by the industry. For this work, Adams received the prestigious Edward Longstreth Medal of the Franklin Institute in 1924.

Birefringence due to strain in glass and its elimination by annealing continued to be one of Adams' interests for many years. The paper "A Method for the Precise Measurement of Optical Path Difference, Especially in Stressed Glass" by Goranson[4] and Adams (1933) illustrated this continuing interest, Adams' skill as an experimenter, and his ability to explore in depth a strange field (Friedel optics) and find gold.

In passing, it should be noted that perusal of a list of Adams' publications, approximately 100, will reveal that many, in fact the majority, were published jointly with other investigators. It was a well-known fact among his colleagues, however, that Leason Adams never allowed his name to appear on a paper unless it contained an original contribution of his own and he endorsed the contents without reservation.

After World War I, Adams resumed his studies of the properties of materials under high pressures and the development of apparatus for making precise measurements over large ranges of pressure and temperature with special interest: (1) in the elastic properties of minerals and rocks; and (2) in fundamental studies of the effects of pressure on simple binary systems, mostly aqueous solutions.

The first line of investigation led him deeply into seismology and other branches of geophysics, particularly those dealing with the nature and composition of the interior of the earth. In the early decades of this century, seismologists were learning how to measure and interpret the velocities of longitudinal and transverse waves traveling deep into the interior of the earth, the famous Oppau explosion furnishing valuable data for the European sector. Adams devised apparatus for measuring the isothermal compressibility at 25°C of selected rocks and minerals between 2000 and 10,000 bars (approximately atmospheres), and with certain plausible assumptions he computed their density as a function of depth within the earth and the velocity of sound waves through them. Comparison of the velocities computed from laboratory measurements and those computed from seismic data indicated that below 60 km there existed material more basic than gabbro and approaching dunite (olivine) in composition. A chapter in the *Smithsonian Report for 1939* gives Adams' ideas on "The Earth's Interior, Its Nature and Composition."

In the course of his investigations of minerals, Adams determined the compressibility of diamond. His paper in the *Journal of the Washington Academy of Sciences* (1921) gives the first measured value obtained for this most incompressible of all minerals and a scholarly discussion of the results in the light of the current theories of solids propounded by Einstein, Gruneisen, Lindemann, and Debye.

In order to extend the range of temperature over which high-pressure effects could be measured, Adams devised a "bomb" in which systems could be studied at pressures up to 3000 bars and from 25 to 800°C. Three papers of geophysical significance came from this development: (1) "The System, Calcium Oxide-Carbon Dioxide" by Smyth[5] and Adams (1923); (2) "The Influence of Hydrostatic Pressure on the Critical Temperature of Magnetization for Iron and Other Materials" by Adams and Green[6] (1931); and (3) "The Influence of Pressure on the High-Low Inversion of Quartz" by Gibson,[7] *Journal of Physical Chemistry* 32(1928):1197.

Adams' second interest at that time, equilibrium in binary systems under pressure, resulted in a number of papers on the behavior of concentrated aqueous solutions of certain salts and their hydrates over a pressure range from 2000 to 12,000 bars. In the course of these pioneering studies, themselves classical examples of meticulous experimental work, Adams critically examined the thermodynamic concepts and logic then coming into wide use by students of solutions, particularly solutions of electrolytes. He had nagging doubts about their consistency and rigor. His paper on "Activity and Related Thermodynamic Quantities; Their Definition and Variation with Temperature and Pressure" (1936), a masterly piece of reasoning, gave for the first time a satisfactory proof of the variations of "activity" with temperature.

His experimental work in this field led to a number of papers by him and R. E. Gibson, of which we may cite "Equilibrium in Binary Systems under Pressure. I. An Experimental and Thermodynamic Investigation of the System, NaCl-$H_2O$, at 25°" by Adams (1931). This was truly pioneering work; it developed experimental methods for measuring accurately the appropriate thermodynamic quantities and rigorous methods for interpreting the data to determine the effects of pressure up to 10,000 bars on equilibria in heterogeneous binary systems.

In 1936, upon the retirement of Dr. Day, who had been director of the Geophysical Laboratory for thirty years, Dr. Adams was appointed acting director and a year later, director. Despite the pressures of administrative work and his constant efforts to encourage and support the staff in the development of their lines of research, Adams continued to work and write on the subjects mentioned above, but then encountered another interruption. Within two years the dark clouds of another world war were rising in the clear sky of American complacency. Along with many of his scientific colleagues, both in and out of the Carnegie Institution, Leason Adams heeded their portent. Putting the interests of the country ahead of his own desires, he interrupted his researches and placed his and the Laboratory's talents at the service of the nation.

In June 1941 he was appointed chairman of Section A, Division A (and a year later chairman of Division I), of the National Defense Research Committee with the task of investigating, among other things, the erosion of gun barrels caused by the action of hot propellant gases under high pressure and the rapid travel of projectiles along the bores of guns. This problem, which had taxed the ingenuity of ordnance specialists for many decades, was becoming acute, since gun erosion placed more and more severe limitations on the accurate life of guns as the muzzle velocities of shells were increased to meet urgent military requirements. With characteristic thoroughness, Adams set out to master available information and experience on gun erosion and assembled a group of scientists and engineers, backed by industrial firms and military arsenals, to study the problem and develop practical solutions.* This team effort did produce very significant results leading to improvements in ordnance that were adopted by the armed services and brought high-level recognition to members of the group. Adams himself was awarded the Presidential Medal for Merit in 1948.

Shortly after the cessation of hostilities, officially August 1945, Adams instituted a comprehensive review of the scientific policy and practices of the Geophysical Laboratory in the light of irreversible changes brought about by World War II. Some prewar programs were dropped, the investigators having moved into other fields; some were strengthened in the light of advances in instrumentation arising from the war effort. An excellent account of Adams' philosophy, his views

*For further information see John E. Burchard, ed., *Rockets, Guns and Targets* (Boston: Atlantic Monthly Press, Little Brown, 1948).

of the Laboratory's objectives, and an account of its programs are given in his annual report for the year 1947–1948 (*Carnegie Institution of Washington Yearbook,* 47), of which the first paragraph is quoted here.

> Studies of the earth have as their objective the determination of the nature of the processes whereby the whole earth and the materials of which it is composed have come into being and have acquired the forms, the disposition, and the mutual relations in which we find them. If we may be permitted to borrow terms from our biological colleagues and to expand their meanings somewhat, it might be said that earth processes are studied *in vivo, in vitro,* and *post mortem.*

The Laboratory program was to follow these three approaches with greatest, but not exclusive, emphasis on *in vitro,* that is, controlled experimental techniques.

The general policy and *modus operandi* as stated originally by Dr. Day remained unchanged. The staff members of the Laboratory, chosen for their keen interest in the Laboratory's broad objectives, were given free rein to formulate their own problems and to solve them. Many scientists who have since gained international reputations joined the Laboratory during Adams' term as director.

Upon his retirement in 1952 at the age of sixty-five, Leason Adams left an organization whose morale, enthusiasm, and ever increasing record of excellent scientific productivity remained outstanding after nearly fifty years, an achievement not often equalled.

In the postwar years, Dr. Adams resumed his personal studies of the effects of high pressure and temperature on the properties of rocks and minerals and of seismological exploration of the earth's crust. He worked with Dr. H. S. Yoder, Jr.[8] (now director of the Laboratory), on the design and use of apparatus for measuring the thermodynamic properties of solids including polymorphic transitions at pressures up to 12,000 bars and temperatures above 600°C, a project that made available vast areas of geophysical knowledge. Adams' paper on the stability of jadeite (1953) gives an example of this work. Advances in electronics during the war had placed in the hands of the Department of Terrestrial Magnetism (DTM) of the Carnegie Institution powerful new resources for the sensitive and precise measurement of motion and time from which were constructed very sensitive seismographs. In a cooperative program involving the DTM, the Navy, and the Geophysical Laboratory, these seismographs were deployed in the field and used to measure the travel time of shock waves initiated by suitably placed charges of explosives. Adams himself participated in the collection and interpretation of these data.

After his retirement, Dr. Adams served as a technical consultant to the National Bureau of Standards in the field of measuring and interpreting the effects of high pressures on a variety of materials.

These years were not kind to him personally. Jeannette Adams, his wife, with whom he had shared the vicissitudes of forty-seven years, died in 1954. His oldest son, Leason Blaisdell, died in the same year, and within a few years of the death of Ralston Adams, his youngest son.

The year 1957 saw the start of a new career for Leason Adams. He accepted an invitation from the University of California, Los Angeles, to become visiting professor of geophysics in the Institute of Geophysics and Planetary Physics. Together with his second wife, the former Freda R. Ostrow, whom he had married in July 1956, he pulled up his roots in Washington, sold their home, and established a new home in Pacific Palisades, California. Both Dr. and Mrs. Adams became thoroughly enthusiastic about West Coast living, and their hospitality is still remembered with pleasure by faculty members and former students alike.

At the Institute for Geophysics and Planetary Physics there was at that time a group actively working on the stability of rocks and minerals under high pressure and high temperature. Adams immediately started to implement his own interest and experience in this field by designing, constructing, and using an apparatus whereby changes in the crystallographic parameters of solids could be measured by analysis of their X-ray spectra, obtained directly as their pressure and, later, temperature environments were varied over very wide ranges. He adapted the anvil device originally developed by P. W. Bridgman in which the sample was placed between two opposing Carboloy anvils mounted in a powerful hydraulic press. Because Carboloy is not adequately transparent to X-rays, Adams first explored diamond as an anvil material, but found experimental difficulties, which could be overcome, but which were really unnecessary. After a year or so, Adams and his graduate student assistant, Briant L. Davis (now research professor of geophysics at the South Dakota School of Mines and Technology) turned to beryllium as their anvil material. The choice proved to be a very happy one—the strength and low atomic number of beryllium were appropriate for the transmission of high pressure to, and X-rays through, the specimen under study. By using an X-ray goniometer rather than a photographic method, Adams and Davis were able to make *continuous* series of measurements, extending over several hours, of the cell constants of specimens and, therefore, study the reaction kinetics of polymorphic transformations as well as the properties and regions of stability of the different polymorphs. This apparatus was finally developed to achieve pressures in excess of 25,000 bars and 500°C. It was unique at that time, but was soon reproduced by other investigators in the Institute and elsewhere, and, as was to be expected, has undergone refinements that have led to even better quantitative observations of the properties of solids over wider ranges of pressure and temperature.

Among the many systems he studied with his colleagues, Adams returned to a problem that had been on his mind for forty years—the calcite-aragonite transformation. At last he was able to study the kinetics of this transformation over a wide range of pressure and temperature, and with Dr. Davis he drew from the results some conclusions of geological interest (*Journal of Geophysical Research,* 1965).

As a result of his work at UCLA, Adams published some eight papers, all of them, in the words used by mathematicians, nontrivial. The majority, written with B. L. Davis, concerned the thermodynamic and kinetic properties of solids at high pressures and temperatures, and improved apparatus for extending these studies. Another paper, "Enthalpy Changes as Determined from Fusion Curves in Binary Systems" by Adams and Cohen (1966), was inspired by a problem brought to him by Lewis H. Cohen, then a graduate student (now professor of geophysics at the University of California, Riverside). In it, Adams returns to one of his early loves, the use of the thermodynamic reasoning of J. Willard Gibbs in solving problems presented by systems of potential geological applications.

Dr. Adams relinquished his professorship at UCLA and returned to Washington in March 1965. Failing eyesight had made experimental work more and more a strain on him, but it is not at all out of the question that half a century of life and work in the Washington area acted as a magnet against whose effects the wiles of California were powerless.

Two remarks made by his former associates at UCLA have a familiar ring to those who knew Adams before his retirement. Dr. Cohen wrote, "Through this gentleman from a generation long before mine, I derived more of a continuity with the past than I have from anyone else. When he left

UCLA in March of 1965 to go back to Washington, he inscribed his copy of Bridgman's *Physics of High Pressure* to me. I still cherish that volume more than any other book I possess."* Dr. Davis wrote, "One of the great qualities of Professor Adams was his willingness to allow the graduate student to pursue independent lines of thinking without structuring his thoughts or curtailing these independent probes into new areas. He would also take time to review papers or articles prepared for publication, which though not in his direct areas of interest, were studied by him for their content and presentability to the scientific community. . . . Professor Leason Adams has unquestionably left a mark on the scientific community, not only through his basic contributions to the field of geophysics, but also through the betterment and scientific development of his colleagues and students."†

Leason Adams was a gregarious man. He loved to exchange ideas and match wits with his fellows. Those who once tasted his soft spoken humor, his ready wit, and his encyclopedic knowledge gave him every opportunity to do so. He found outlets for these propensities in many ways, of which a few may be recalled here.

Participation in the activities of scientific societies afforded him greatest intellectual pleasure and contributed a great deal to his education. In this connection we might recall a remarkable, perceptive statement of Joseph Henry:

> Man is a sympathetic being, and no incentive to mental exertion is more powerful than that which springs from a desire for the approbation of his fellow men; besides this, frequent interchange of ideas and appreciative encouragement are almost essential to the successful prosecution of labors requiring profound thought and continued mental exertion. Hence it is important that those engaged in similar pursuits should have opportunities for frequent meetings at stated periods.... Furthermore, a society of

* Personal communication.

† Personal communication.

this kind becomes a means of instruction to all its members, the knowledge of each becoming, as it were, the knowledge of the whole.*

In the first three decades of this century, the scientific life of Washington was young, vigorous, and uncomplicated. Organizations such as the Bureau of Standards, the Naval Observatory, the Coast and Geodetic Survey, the Bureau of Chemistry of the Department of Agriculture, the Surgeon General's Office, the Hygienic Laboratory, the Carnegie Institution, the Naval Research Laboratory, the Geological Survey, the Smithsonian Institution, the Bureau of Ethnology, and others had attracted men of outstanding scientific caliber, who, while engaged in research inspired by practical problems, retained a deep interest in the fundamentals of their specific disciplines, keeping themselves abreast of the progress of these disciplines not only for their intellectual satisfaction, but also as sources of material for their applied researches. Those men and women pooled their knowledge and experience in the meetings of the various scientific societies.

Because the career of L. H. Adams was to a great extent influenced by the scientific climate in Washington, and in turn exerted reciprocally a constructive influence on this environment, it may be appropriate here to delineate the characteristics of the societies that reflected this environment. The oldest, the Philosophical Society of Washington, held its first meeting on March 13, 1871, with Joseph Henry in the chair. The Society "embraced *all sciences*, except those, if they be sciences, of speculative thought."† In those days a

*Joseph Henry, Anniversary Address to the Philosophical Society of Washington (1871), *Bulletin of the Philosophical Society*, 1 (1874): v–xiv.

†See W. J. Humphreys, "The Philosophical Society of Washington through a Thousand Meetings," *Journal of the Washington Academy of Sciences*, 20(1930): 245–316. This paper includes photographs of the presidents of the Society from 1871 through 1930. F. N. Frenkiel in "Origins and Early Days of the Philosophical

well-educated, intellectual man could be expected to take an intelligent interest in the whole spectrum of the sciences from mathematics to descriptive biology. Recognizing this, Joseph Henry, in his first presidential address (November 1871) remarked, "With so many facilities as exist in the City of Washington for the pursuit of science, this Society would be derelict in duty did it fail to materially aid, through communication of thought and concert of action, the advancement of the great cause of human improvement." In 1980 people are still trying feverishly to implement, without much knowledge of the past, the wisdom of Joseph Henry. Although the Philosophical Society made provision for the establishment of sections to accommodate members with specialized interests, this arrangement proved to be inadequate to cope with the rapid advances in all branches of science. As a result specialists formed societies of their own—the chemists in 1874, the anthropologists in 1878, the biologists in 1880, the entomologists in 1884, the geographers in 1888, the geologists in 1893—so that for a long time the chief interest of members of the Philosophical Society lay in the fields of the more mathematically dependent sciences—physics, astronomy, geodesy, geophysics, meteorology, and the like.

Prior to the end of World War II, the meetings of the Philosophical Society of Washington were devoted chiefly to papers and informal communications by members, or local people introduced by members. It formed a valuable forum where an investigator could present a recently completed piece of work for the edification and criticism of his fellows, or where interesting pieces of information gained by reading or experience could be aired.

Furthermore, through the *Bulletin* of the Society, and

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Society of Washington," *Bulletin of the Philosophical Society of Washington*, 16(1963):9–24, gives an even more detailed account of the antecedents, the founding, and the history of the Society.

later minutes published in the *Journal of the Washington Academy of Sciences,* the priority date of the presentation of a paper was established. (This was before the days when newspapers became a common vehicle for the early publication of scientific results and also before the lecturer from out of town with accompanying expenses became popular.)

Adams was elected a member of the Philosophical Society in 1910 and for many years participated enthusiastically in its activities. He read a number of papers before the Society, contributed regularly to the discussions, and took on some of the chores of planning and operating the Society through membership on committees or election to office. In 1929 he was elected the fifty-first president of the Society.

In 1909 Leason Adams joined the American Chemical Society, which automatically made him a member of the Chemical Society of Washington (CSW). He soon took part enthusiastically in the activities of this Society, both scientific and social. The intellectual fare served up at the meetings of the CSW was excellent—the membership consisted of chemists, mainly hand-picked men and women attracted to Washington by senior officials of international reputation and by the opportunity to work on vital and interesting problems.

Compared with the somewhat serious and staid physicists, the chemists were a rather convivial bunch. They smoked pipes, enjoyed a glass of beer, played poker, and had an inexhaustible supply of diverting anecdotes in addition to tastes for music and other arts. Adams found their company much to his liking. His capacity to down a tankard of beer in record time became legendary. In later years, after his retirement, his visits to Washington were a signal to certain chemists and their comrades in other disciplines to organize a poker party.

It was not surprising that his services as a leader in organizing the meetings of the CSW were in great demand and that he was elected president for the year 1925. Among other innovations he introduced into the CSW was the establishment of the Hillebrand Prize, the first of which he presented to R. F. Jackson in 1925. Adams' presidential address, "Chemistry as a Branch of Mathematics," was a good example of the breadth of his scientific interest.

Adams also took part in the affairs of the national society, the American Chemical Society. He served as councillor (1926–1929), associate editor of the *Journal* of the Society (1934–1948), and regional director (1940–1945).

Between 1910 and 1926 or so, there existed in Washington an unorganized body known as the Metachemical Club. It was composed of chemists who met at irregular intervals for dinner and discussion of metachemistry—any subject beyond chemistry. The name of the Club is probably ascribable to John Johnston. Adams may have been in at the founding of the Club; he was certainly one of the early members.

In the last three decades of the nineteenth century, the number and variety of scientific activities in Washington, noted by Joseph Henry, grew exponentially and, indeed, has done so ever since. The consequent proliferation of specialized societies suggested the desirability of an organization to act as a federating agency to which various societies might adhere, loosely perhaps, but providing a vehicle for interdisciplinary communication and concert of action. Local leaders, led by the Philosophical Society, moved to establish a Washington Academy of Sciences, which was incorporated on February 18, 1898. Leason Adams was elected a member (now called a fellow) of the Academy in 1912. Among other activities related to the Academy, he became very interested in the welfare of its *Journal.* Being concerned that the vitality of an academy journal depended on the variety as well as the quality of the papers published, he tried to persuade his friends in the physical sciences to publish at least some of their work in the *Journal* (there was no dearth of papers in the descriptive natural sciences). He himself contributed some fourteen papers in the *Journal* between 1912 and 1931, among these his classical paper on the compressibility of diamond. He was elected president of the Academy in 1932.

Adams' growing interest in geology, the chief source of material for *in vitro* investigation of the earth, inspired his membership in a number of societies specializing in discussions of, and publication about, this subject—the Geological Society of Washington (of which he was elected president in 1950), the Geological Society of America, and the Mineralogical Society of Great Britain and Ireland. In addition, he took an active part in two informal dynamic groups in Washington, the Petrologists' Club and the Pick and Hammer Club, who held meetings in various places, often in the Geophysical Laboratory.

The American Geophysical Union (AGU) was created in 1919 as an Executive Committee of the National Research Council of the National Academy of Sciences to function as the American National Committee of the newly formed International Union of Geodesy and Geophysics. Its diverse scientific agenda were carried out by six sections, specializing in the fields of geodesy, seismology, meteorology, terrestrial magnetism and electricity, oceanography, and volcanology, corresponding to the associations of the International Union (later two new sections were added—hydrology in 1930 and tectonophysics in 1940). Within a year after its foundation, Leason Adams was selected as a member of the AGU and was soon loaded with new responsibilities. He was president of the Section of Volcanology from 1922 to 1924, president of the Section of Seismology (1926–1929), vice president of the Union (1929–1930, 1941–1944), and the first president of the Section of Tectonophysics (1940–1943). He was elected president of the AGU for the term 1944–1947 and also had the honor of serving as vice president of the International Union of Geodesy and Geophysics for the years 1948 through 1951.

In presenting Dr. Adams for the Bowie Medal, the highest award of the AGU, M. A. Tuve remarked on May 1, 1950, "I am privileged to recommend to the Union for the honor of the Twelfth Annual Award [of the Bowie Medal] a geophysicist who not only meets in the fullest the requirements of attainment and contribution in the advancement of geophysics for over forty years, but is also an outstanding example of devotion to his chosen field."

For fifty-four years, from the date of his election in 1915 to his death in 1969, Leason Adams derived great pleasure and no little pride from his membership in the Cosmos Club.* Here he had the opportunity to mingle with men from all over the world distinguished in a wide variety of learned professions, to exchange views with them in the lounge or the dining room, to match wits with them over the bridge table. From 1932 through 1936 he served on the Committee on Admissions, a most exacting assignment, as its secretary in

*According to Dr. Humphreys ("Philosophical Society of Washington"), the original inspiration for the founding of the Cosmos Club arose in the Philosophical Society, which for many years held its meetings in the Surgeon General's office in the Old Ford's Theatre Building. At the close of the scientific meetings, members fell into discussions of general topics that more and more frequently had to be continued over beer and pretzels in the more relaxed environment of a nearby tavern. The pleasure and profit derived from these discussions led to the idea of creating a club where members of the scientific community might be joined in a dignified, convivial atmosphere by their fellows, interested and practicing in the fields of literature, the fine arts, public service, and the like. A period of gestation ensued. During this time the desirability of such a club in Washington seems to have occurred to a number of people, including those who had pleasant impressions of similar institutions in London and New York. The written histories of the Cosmos Club make no mention of the role of the Philosophical Society in its inception. However, the fact that the entire Board of Managers of the new club were members of the Philosophical Society and that by resolution of the Club on December 12, 1878, all members of the Society were invited to become original members of the Club indicates that the accounts of Humphreys and Frenkiel are substantive.

1932, and chairman in 1934 and 1935. Recognizing his stature as a scientist, his acknowledged good judgment, and his devotion to the Club's welfare, his fellow members elected him vice president in 1938 and president in 1939.

In recognition of his contributions to geophysics, the National Academy of Sciences elected Dr. Adams to membership (rather belatedly perhaps) in 1954. Among other honorary memberships he held were fellow of the Royal Astronomical Society (London), Sigma Xi, and Phi Lambda Upsilon.

Leason Adams enjoyed teaching, particularly the instruction of advanced students. Unfortunately, the demands of other duties prevented him from indulging his taste for teaching as much as he would have liked. However, he taught physical chemistry and thermodynamics at the George Washington University (1927–1928) and never refused an invitation to address students of other universities both in and out of Washington. His experiences as visiting professor at UCLA have already been outlined. Adams' formal lectures were more solid and systematic than entertaining, but in an informal question and answer seminar his performance was superb. An onlooker could see that he soon established a complete rapport with the students, and as the seminar progressed their faces lighted up with understanding as his sympathetic answers to questions or his lucid explanations of points of interest proceeded. Adams was an "opener of doors" to his students and younger colleagues, an educator in the best sense of the term.

No biography of Leason H. Adams would be complete without an account of his extra-professional activities, which were motivated by the same curiosity and carried out with the same informed thoroughness that characterized *all* his undertakings.

He was one of the early radio fans; starting with crystal sets and headphones, he built a series of radio receivers that reflected the rapid advances in technology occurring during the second and third decades of this century. Visitors to his home on 39th Street, N.W., were entertained by a progression of radio entertainments, first through headphones, then from horn loud speakers, and finally from a succession of cone speakers of ever-increasing quality. His early interest in what is now called electronics is reflected in papers he published in 1919 and 1924.

While a member of the staff of the Geophysical Laboratory, he designed and supervised in detail the building of two houses. The first, built in 1916, was situated about a block southwest of Chevy Chase Circle; the second, built in the 1930's, on a large tract of land at Bradley Boulevard and Burdette Road in Maryland, then far out in the country. By this time Adams had become a very knowledgeable gardener, and laid out his property somewhat in the style of an English landscape garden, a formal garden centered around a large lily pool and surrounded by indigenous trees and wildflowers.

His love of the outdoors, probably cultivated during his boyhood in southern Illinois, manifested itself in many ways, of which a few may be mentioned here. In the late 1920's he spent many weekends with his colleagues, J. Frank Schairer[9] and others, clearing out trees and underbrush to blaze part of the Appalachian Trail in the mountains of Virginia. He was one of the pioneers in making this now famous recreational asset.

He played golf and was a member of the Kirkside Golf Club, a small but attractive course situated west-southwest of Chevy Chase Circle, but long since fallen a victim to real estate developers. He was also a member of a group called the "Early Birds" or the "Oily Boids," which met frequently on the first tee of Rock Creek Golf Course promptly at 6:00 a.m., to complete a round before work of the day began. In the early 1930's he studied the art of sailing with customary diligence; to practice it he built in his garage, with the help of his oldest son, a Snipe, a sixteen foot sailing boat, and sailed out of West River, Maryland. He soon showed practical as well as theoretical mastery of the art.

His retirement years between his departure from UCLA in 1965 and his death on August 20, 1969 were peaceful ones. His home life was relaxed and happy. He retained an active interest in the scientific and social activities of his former colleagues, both young and old, and was often seen in the Cosmos Club. During these years his unquenchable curiosity led him to explore those areas that lie beyond the boundaries of systematic experiment and theory and into the realm of first sources—the realm of the thinkers, prophets, and poets who saw the hand of one God in all the phenomena of nature and of human experience. He took particular pleasure in conversations with rabbis and other students of the Old Testament.

The life and work of Leason H. Adams might be epitomized by the statement that he was truly a representative of the nineteenth century American school of pragmatic natural philosophers, a self-reliant school that took no man's word for it but looked to Nature herself for answers to its questions. Like those he admired and emulated—Joseph Henry, Willard Gibbs, Benjamin Silliman, Percy Bridgman, Theodore Richards, Richard Tolman, Arthur Day—his inquiring mind was disciplined by a passion to "get the facts" and link them together in terms of operationally-defined concepts and rigorous mathematics. Speculation and dogma were luxuries he felt he could not afford. His curiosity led him into many fields of science, and words paraphrased from Samuel

Johnson's epitaph of Oliver Goldsmith may aptly apply to Leason Adams:

*Qui nullum fere scientiae genus non tetigit,*
*Nullum quod tetigit non ornavit.*

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# APPENDIX

## *Notes on Members of the Geophysical Laboratory Mentioned in the Text*

1. Erskine D. Williamson (1886–1923): M.A., B.Sc., Edinburgh University; Mathematician and Physical Chemist, Geophysical Laboratory, 1914–1923.
   George W. Morey (1888–1965): B.S., University of Minnesota; Chemist, Geophysical Laboratory, 1912–1957; Acting Director, 1952–1953.
2. Arthur L. Day (1869–1960): B.A., Ph.D., Yale University; Director, Geophysical Laboratory, 1907–1936.
   E. T. Allen (1864–1964): A.B., Amherst College; Ph.D., The Johns Hopkins University; Chemist, Geophysical Laboratory, 1907–1932.
   E. S. Shepherd (1879–1949): A.B., Cornell University; Chemist, Geophysical Laboratory, 1907–1946.
   Walter P. White (1867–1946): A.B., Amherst College; Ph.D., Cornell University; Physicist, Geophysical Laboratory, 1907–1935.
   G. A. Rankin (1884–1963): A.B., Cornell University; Chemist, Geophysical Laboratory, 1907–1916.
   F. E. Wright (1877–1953): Ph.D., Heidelberg University; Physicist, Geophysical Laboratory, 1907–1944.
   J. K. Clement (1800–?): B.S., Trinity College; Ph.D., Göttingen University; Chemist, Geophysical Laboratory, 1907.
3. John Johnston (1881–1950): D.Sc., St. Andrews University; Chemist, Geophysical Laboratory, 1908–1916; Sterling Professor of Chemistry, Yale University, 1919–1927; Director of Research, U.S. Steel Corporation, 1927–1946.
4. Roy W. Goranson (1900–1956): B.A., British Columbia University; Ph.D., Harvard University; Petrologist, Geophysical Laboratory, 1926–1951; Physicist, Los Alamos Scientific Laboratory, 1951–1956.
5. F. Hastings Smyth (1888–1960): A.B., Hamilton College; Ph.D., Massachusetts Institute of Technology; Chemist, Geophysical Laboratory, 1919–1925; Priest, member Cowley Fathers, 1927–1960.
6. J. W. Green (1874–1971): Physicist, Department of Terrestrial Magnetism, 1920–1938; prior to 1920, Observer, U.S. Coast and Geodetic Survey. Assigned to the Geophysical Laboratory by DTM to conduct cooperative studies of the effect of pressure on the magnetic inversion of iron.
7. R. E. Gibson (1901–): B.Sc., Ph.D., Edinburgh University; Physical Chemist, Geophysical Laboratory, 1924–1946; Applied Physics Laboratory of The Johns Hopkins University, 1946–; Acting Director, 1947; Director, 1948–1969; Professor of Biomedical Engineering, The Johns Hopkins University School of Medicine, 1969–1978.
8. Hatten S. Yoder, Jr. (1921–): S.B., University of Chicago; Ph.D., Massachusetts Institute of Technology; Petrologist, Geophysical Laboratory, 1948–; Director, 1971–.
9. J. F. Schairer (1904–1970): B.S., Ph.D., Yale University; Petrologist, Geophysical Laboratory, 1927–1970.

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