

Dr. Abbot Saw Momentous Changes In 78 Years at SI

Dr. Abbot wrote his autobiography, *Adventures in the World of Science*, in 1958, when he was 86 years of age and one of the things he gazed back upon was his rather abrupt arrival at the Smithsonian Institution in June 1895. Twenty-three years old, he was working on his master's thesis in an MIT laboratory when without warning he was informed that Secretary Langley of the Smithsonian wanted to see him. In his dirty, acid-holed coverall he hurried out to meet a stout gentleman with a silk hat.

"How do you do?" said Dr. Abbot. "Wouldn't you like to see my experiment?"

"I would like it extremely," replied Langley, "but I regret that my engagements will not permit."

That was that. Langley looked Dr. Abbot up and down for a minute or so, and then turned and left. The next day the astonished Dr. Abbot received a telegram offering him a job at \$1,200 a year as an assistant at the Astrophysical Observatory. He was asked to report immediately to learn his duties. Dr. Abbot did not even know what the Astrophysical Observatory was but the salary seemed a fortune and so he packed and that night boarded the train for Washington.

It had been cold and rainy in Boston and Dr. Abbot got off the train the next morning loaded down with an umbrella, rubbers and overcoat—only to find Washington's temperature in the high 90's. Dr. Abbot remembered ruefully that he must have looked like a very foolish tourist with his Boston foul weather-gear because a guide spotted him as he was walking down Pennsylvania Avenue and offered to show him through the Botanic Gardens.

Boarding a horsecar that took him by a roundabout route to the Smithsonian, Dr. Abbot hurried into the Astrophysical Observatory, which was housed in sheds behind the Castle. He was told that Secretary Langley had left on a trip abroad and that there had been no need for his haste in coming. With Langley away that first summer there was little to do and, with the temperature in the sheds reaching 120 degrees, Dr. Abbot recalled that he learned mainly to stretch out on a table and wait.

A Leisurely Capital

He had arrived in Washington's summer season, which in those days meant that the Capital slowed down and did not awaken again until October. Government workers were given a 30-day holiday. Some took the train to resorts and others spent their vacations at home keeping as cool as they could and perhaps attending a baseball game now and then. Dr. Abbot remembered that it cost 25 cents to sit in the wooden stands and watch a game. Washington's team was usually in last place and Dr. Abbot, always an admirer of spirit and ingenuity, became a Baltimore fan. Baltimore had John McGraw who had invented the bunt and helped devise the hit-and-run and squeeze plays.

It had not taken Dr. Abbot long to impress Secretary Langley with his own inventive capabilities. When he had returned from his 1895 summer trip he called Dr. Abbot in and asked him what he would recommend to improve the Observatory's spectrophotometric equipment. Without hesitation, Dr. Abbot replied, "I would do away with the great resistance box which balances the bolometer, and make a small water-jacketed companion piece instead." Langley saw his point at once and told him to go ahead and design the new device. The results so pleased Langley that Dr. Abbot soon was promoted to supervise the Observatory.

Dr. Abbot's memoirs are sprinkled with anecdotes of the remarkable men he came into contact with at the Smithsonian in those early years. There is a vignette

(Continued on page 2)



Dr. Charles Greeley Abbot
1872-1973

Secretary of the Smithsonian, 1928-1944

Photograph by Yoichi Okamoto for Smithsonian magazine

Dr. C. G. Abbot, Former Secretary Of SI, Dies at 101

Dr. Charles Greeley Abbot, a pioneer scientist in the field of solar studies who guided the Smithsonian Institution as its Secretary from 1928 to 1944, died December 17 in a suburban Maryland hospital after a brief illness.

Dr. Abbot joined the Smithsonian staff in 1895. He celebrated his 101st birthday last May at the Institution. Until last October he came in regularly to work. His birthday parties became events anticipated with pleasure by Smithsonian personnel who gathered to greet him outside the old Smithsonian building on those occasions. Although many of them were generations younger than Dr. Abbot, all found his dedication to the Institution and to science an inspiration and saw in him a living link to the great formative years of the Smithsonian that made it famous throughout the world for its scientific research.

Dr. Abbot was a scientist who was a religious man, and who also had a lighter side in evidence when he took time to tell an anecdote or sing a favorite sea chantey. His experiences at the Smithsonian spanned more than a normal lifetime's witnessing of historical events, including a day when he stood atop the Smithsonian castle and watched the first attempts at powered flight on the Potomac River, and another day when he was among those welcoming astronauts presenting a sample of the lunar surface to the Institution.

Abbot Moon Crater

He was one of the first living persons to have a moon crater named for him. He is believed to be the oldest person ever granted a patent, at the age of 100 for a device to harness solar power.

Among his achievements while at the Smithsonian was the organization of the Division of Radiation and Organisms, now the Radiation Biology Laboratory, which pioneered studies on the dependence of plant growth on radiation. A major result of his solar studies was Dr. Abbot's theory that the world's weather is correlated with cyclical variations in the sun's energy output.

Dr. Abbot was born on a farm at Wilton, N.H., on May 31, 1872, and in his boyhood revealed the technical facility which later served him well in his researches. Using the kitchen stove as a torch, he soldered copper pans and mended enamel ones for the household before he was old enough to work on the farm. He decided to make himself a bicycle when he was 13. First he built a forge with which he mended farm implements. Then over a two-year period he built himself a high-wheeled wooden bicycle with iron tires which he used for years. He also rigged up a wooden water wheel and fashioned a saw out of a tin can.

Until he was 13 he went to the country district school at Wilton. He dropped out to become a carpenter, but after a year at home resumed his studies in the village high school from which he was graduated. A cousin attending Harvard influenced his family to send him to Phillips Academy in Andover, Mass., for a year. At the end of that term, some of his classmates went to Boston to take entrance examinations for the Massachusetts Institute of Technology.

Since he had traveled on a train only once, the prospect of the ride appealed to him, and Dr. Abbot decided to go too. He and his friends wandered around Boston sightseeing. When it was time to take the examinations, Dr. Abbot was afraid he might get lost so he took them also. He passed them all. When his family learned this, they decided to make the necessary sacrifices to finance his studies.

Dr. Abbot first took chemical engineering, but a professor, Dr. A. A. Noyes, suggested he change to physics instead. Although he had to make up a whole year's work in physics to grad-

(Continued on page 4)



THE SMITHSONIAN TORCH

Smithsonian Institution, Washington, D.C.

January 4, 1974

A Tribute by Secretary Ripley

This is indeed a sad day for the Smithsonian Institution. After 78 years, we had almost come to think that we would have Charles Greeley Abbot with us always. But even though we have lost his delightful companionship, we still have the wealth of memories and accomplishments that he leaves behind.

It is truly amazing that a man who was ahead of his time 70 years ago could still be ahead of his time today, and yet that has been the case with Dr. Abbot. He began measuring solar radiation in 1902, built a solar-powered oven in 1920, and in 1972 received a patent on a solar battery. Today the energy crisis has us finally looking seriously at a subject Dr. Abbot has been pioneering throughout the entire 20th century.

The oldest living member of the National Academy of Sciences, Charles Greeley Abbot made tremendous contributions to the field of solar radiation during his long career. His work underlies current studies of the Smithsonian Astrophysical Observatory, of which he was the first professional staff member. He also established the first solar radiation observatory in Chile in 1918.

Charles Greeley Abbot's foresight ex-

tended to other people's research as well. It was he who saw the value of the rocket research of Robert Goddard and proposed that the then-Secretary, Charles Walcott, arrange for the Smithsonian to provide him with financial support.

Even though he was an outstanding scientist, it is the person, one might even say the legend, that we will recall most vividly—Dr. Abbot Merlin-like in the tower of the Smithsonian castle forecasting the weather years hence; Dr. Abbot taking time to tell brides if their wedding days would be sunny; Dr. Abbot singing sea chanteys at his 100th birthday party; Dr. Abbot standing on top of the tower to watch Samuel Langley's pre-Wright Brothers attempt at flight and then being present when the Apollo 11 astronauts brought the first lunar sample to the Smithsonian.

Charles Greeley Abbot was a pioneer in his branch of science, an outstanding Secretary of the Smithsonian, but most of all, a charming, witty and warm individual. Losing him, especially so soon after losing our dear colleague Leonard Carmichael, is a great blow to the entire Smithsonian family. He leaves a void that can never be refilled.

Highlights of Dr. Abbot's Years

Photographs from Smithsonian Archives



As a young scientist, Dr. Abbot went to Wadesboro, N.C., to observe an eclipse on May 28, 1900. It was the first of many such trips throughout the world.



Dr. Abbot as he appeared as Secretary.



Leaders of American government, science and industry met in the Great Hall of the Smithsonian building on February 11, 1927, to plan the Smithsonian's future. In front row, from left, are Secretary of Treasury Andrew Mellon; Secretary of State Frank B. Kellogg; President Calvin Coolidge; Chief Justice William Howard Taft, and Dr. Abbot who that time was Acting Secretary. Herbert Hoover is between Coolidge and Taft, and the man who would succeed Dr. Abbot as Secretary, Dr. Alexander Wetmore, is the third man directly behind Taft. In a letter 37 years later, Dr. Abbot recalled that the setting included a column 23 feet high, four books square, built of Smithsonian publications (seen in the background).

Early Years

(Continued from page 1)

of Langley and Major John Wesley Powell dining together on a Potomac outing, Langley cutting up the food for the great one-armed explorer. Teddy Roosevelt was a favorite of Dr. Abbot's, and he tells the story of Langley's taking T.R. on a Sunday tour of the Observatory and, as each instrument was shown, T.R. exclaiming: "By George! Wonderful! Wonderful!"

Secretary Langley was considered an autocratic man feared by nearly everyone at the Smithsonian, but Dr. Abbott saw him as a shy man with a warm heart, and a great scientist. On his first day on the job, Dr. Abbot remarked at the fact that the grass around the Observatory buildings was growing 10 inches high. "The Secretary loves secrecy and keeps the grass long so that news writers will not think there is anybody here," he was told. Dr. Abbot offers the opinion that this dislike and distrust of reporters probably cost Langley dearly in 1903 when flights of his airplane were attempted.

"Reporters took their revenge on him when it crashed," he said.

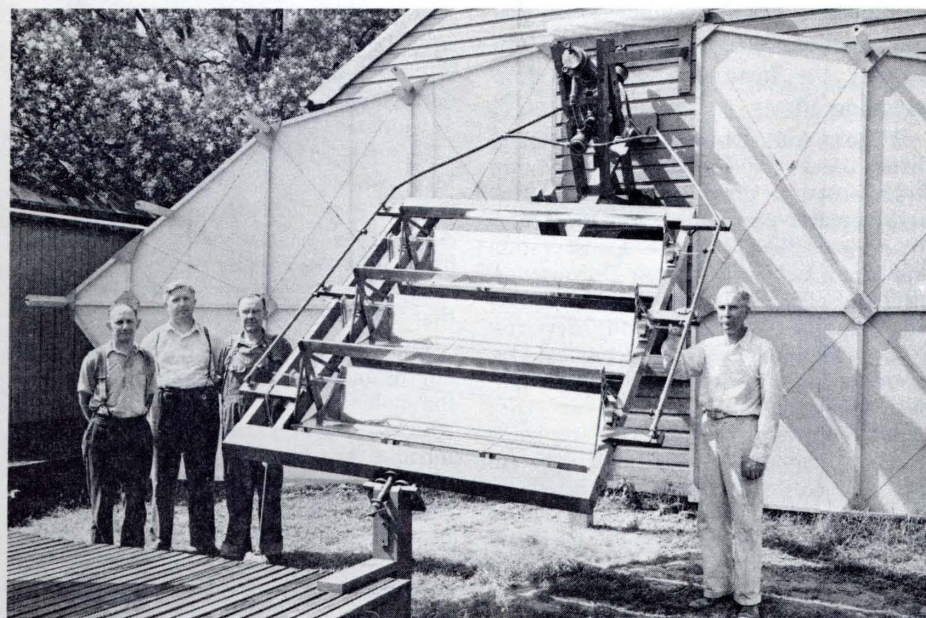
Dr. Abbot, as it happened, watched the flight. He recalls climbing up to the roof of the Smithsonian Castle's highest tower and watching through his four-inch telescope Langley's historic attempt to catapult his four-winged machine into the air from a houseboat on the Potomac.

"I saw the craft go off the houseboat, nose sharply upward, and wheel backward into the water after the front wings collapsed," Dr. Abbot said. The failure was grievously disappointing to Langley because 10 days later the news came of the Wright Brothers' success at Kitty Hawk.

Serving and Guiding the Smithsonian



A chart compares Dr. Abbot's weather predictions with the actual record.



Solar boiler developed in 1936 by Dr. Abbot (right) and exhibited at the International Congress of Engineers.



Blowing out the candle at his 101st birthday party.

Langley died in 1906 and was succeeded as Secretary by Charles Walcott, who had been Director of the U.S. Geological Survey. Dr. Abbot recalls him as a commanding man who found time to continue actively his paleontological expeditions to the Canadian Northwest.

"We all saw that a man of very different temperament from Secretary Langley was with us," he wrote. "Where Langley was shrinking from publicity, Walcott enjoyed it. He was an athletic, breezy type of man who would go for a brisk early morning walk in Rock Creek Park and turn up for breakfast with some influential Representative or Senator, or perhaps with the President."

It was incredible to see the changes that had taken place in Washington since his arrival, Dr. Abbot observed in the autobiography.

In 1895 there were no houses on Connecticut Ave. past Calvert St. and the new (1889) National Zoological Park, which had only a few sheds to house its meager collection of animals, was literally in the country. The Government was still tiny. Its only buildings were the Capitol; the White House (without its wings); the adjoining Old State, War and Navy Building; the old brick Agricultural Department Building; the Patent Office and Pension Office Buildings, and the Smithsonian—which lay nestled in its beautiful park with curving dirt roads and paths shaded by rare old trees. Its structures then consisted only of the Castle and the adjacent brick National Museum (A&I) where Grover Cleveland, the incumbent President, had held his first inaugural ball.

"When I lived in Washington in the 1890's, Abbot wrote, we traveled in buggies or horsecars and lighted our homes and streets with kerosene, gas or candles . . . There were no automobiles, no airplanes, no movies, no radio, no television . . . Yet people lived happily then and for myself I can say truly with far less to worry about."



At his last birthday party, Dr. Abbot posed with two other former Secretaries, Dr. Alexander Wetmore (left) and Dr. Leonard Carmichael, Secretary Ripley and Chief Justice Warren Burger (right), Chancellor of the Smithsonian. When Dr. Carmichael died September 16, it was the first death of a Secretary or former Secretary since 1927.

Plans Made to Cut Energy Use, Spur Carpooling Efforts

Forty representatives of Smithsonian divisions met November 27 to discuss methods of coordinating and improving the Institution's energy conservation efforts.

Richard Ault, Director of Support Activities and Smithsonian Conservation Representative, presided. Other participants on the program were Dr. Robert M. Organ, Chief of the Conservation Analytical Laboratory; Don Dormstetter, electrical engineer in the Office of Facilities Planning and Engineering Services; William Wells, Chief of Mechanical Operations, and Hal Cohea, Programs Manager, Support Activities.

All Smithsonian employees are being urged to support and participate in energy conservation efforts. Suggestions should be made through building managers or the Programs Office on extension 5484.

Suggestions are being sought for reduced office and area lighting, and new light switches to isolate area lighting. Employees also are being asked to reduce thermostat settings, to reduce electrical equipment operations, and to increase intercity business trip pooling and carpooling.

"We are approaching our goal of a 7-per-cent reduction in energy consumption and with everyone's help we will make it," Mr. Ault said.

To make it easier for employees to form or join car pools, the Programs Office has produced a computer print-out of Smithsonian employees listed by name, organization code, telephone extension, parking space, and zip code. Employees may obtain print-out sheets of their zip codes or other listings by calling the Programs Office. A zip code map may be obtained from post offices to aid in locating zones that might serve for carpooling purposes. The Council of Governments' computerized carpooling program will be available soon through the Programs Office. The Programs Office also will process Commuter Club questionnaires distributed jointly by WTOP, the Metropolitan Washington Council of Governments and the Metropolitan Washington Board of Trade.

Annuity Raise Goes Into Effect

A 5.5 percent cost-of-living annuity increase for retired Federal employees and survivors became effective January 1.

The increase will be reflected in annuity checks mailed February 1, 1974.

For the first time, employees will no longer be required to retire before the date of the increase, in this case January 1, to receive the benefit of the increase. Under a new law employees who retire on or after January 1 will receive at least as much annuity as if they had retired before January 1. The annuity for those retiring on or after January 1 will be computed on the basis of service and salary as if the employee had retired on December 31, with the 5.5 per-cent increase added. Then a second computation will be made using service and salary up to the actual date of retirement, but not including the 5.5 per-cent increase. The retiree receives the higher of the two figures.

The new law also provides that those retiring on or before December 31 will get the higher of two calculations.

SMITHSONIAN TORCH

January 4, 1974

Published for Smithsonian Institution personnel by the Smithsonian Office of Public Affairs, William O. Craig, Editor.

Dr. Charles Greeley Abbot Dies at 101

(Continued from page 1)

uate with his class, he was able to do it and finished with high honors.

Dr. Abbot expected to get a job teaching but got no offers, so he did graduate work as an assistant in the physical laboratory at MIT. In this period Dr. Abbot did his first published investigations jointly with Dr. Noyes, who later was director of the Gates Chemical Laboratory at the California Institute of Technology.

In 1895, Secretary Langley wrote to MIT seeking an assistant for the Smithsonian Astrophysical Observatory. Dr. Abbot was recommended and after a brief interview with Professor Langley started his long career at the Institution that summer.

Some of Dr. Abbot's first work at the Smithsonian involved improvements in the bolometer—a sensitive thermometer which was being used to study the sun's infrared spectrum. This was the beginning of more than 70 years' research on solar radiation, much of it done with instruments refined or invented by him. One of these was the silver-disk pyrheliometer which is now widely used for measuring solar radiation at the earth's surface.

Solar Studies

Dr. Abbot is credited with being the first to suspect that the radiation of the sun might fluctuate. In 1903 and 1904 he and Professor Langley first obtained experimental indications that there is a relationship between solar variation and the earth's weather.

In 1900, Dr. Abbot went to Wadesboro, N.C., to observe a total eclipse of the sun. This was the first of many trips by him to make solar observations in the far corners of the globe. He was responsible for establishing three solar observatories on different continents.

Dr. Abbot's main work centered on two theories: that the earth's precipitation is related to the rotation of the sun, and that temperature variations are related to another specific solar cycle.

Dr. Abbot believed that the sun could be put to work to provide energy with zero pollution effects—a desirable feature he emphasized especially in recent years as environmental concerns increased. He envisioned great solar-energy power plants built in areas enjoying maximum sunlight. He built a solar cooking stove in 1920 and also harnessed the sun's rays to heat a house in California.

Over the years he continued to devise new methods to use the sun's energy. In 1938, he patented a solar engine which focused sunlight, by use of mirrors and sapphire lenses, into a steel cylinder where superheated air performed the same function as expanding steam in a locomotive or turbine. Just before his 100th birthday, he received another patent for a refinement in his proposed solar power apparatus.

It was a disappointment to Dr. Abbot that most meteorologists did not accept his theory that the weather is correlated with cyclical variations in the sun's energy output. For visitors to his home in recent years he would unroll from around a Quaker Oats box an 18-foot scroll of paper that stretched from one end of his living room rug to the other. On it were tens of thousands of closely spaced handwritten figures recording the monthly precipitation of St. Louis for 104 years, from 1854 through 1957. Zig-zagging the length of the chart were two lines—one showing Dr. Abbot's predictions and the other showing what really happened. Dr. Abbot said his predictions were satisfactory from 50 to 70 per cent of the time.

His system of forecasting was based on the discovery that the sun's radiation varies during a period of 273 months. Within the 273-month period there are subcycles, "harmonics" of the basic cycle, expressed as fractions of the whole. Dr. Abbot found that the 273-month period repeats itself, as do the rainfall and temperature patterns that fall within the cycle and its subcycles. Given sufficient data on an area for a sequence of about 1,000 months, Dr. Abbot would sit down

and come up with a forecast for any day of the year.

If meteorologists were hesitant to accept his predictions, young brides apparently were not. Dr. Abbot said that in one year 14 brides-to-be consulted him about the weather for their wedding days. He predicted fair weather for 13 of them, and the sun shone on all. He told the 14th that it looked doubtful, but she stuck with the date and it turned out to be cloudy.

Secretary in 1928

Dr. Abbot became Assistant Secretary of the Institution in 1918, and was elected Secretary on January 10, 1928. Among other accomplishments while he was Secretary, he received the Gellatly Art Collection, organized the Johnson-Smithsonian Deep Sea Expedition, and promoted more than 100 other scientific expeditions. He was responsible for installing an elevator and finishing eight rooms in the north tower of the Smithsonian building, one of which he used as an office for many years.

Dr. Abbot and his predecessor, Dr. Charles Doolittle Walcott, worked together to encourage the research of Professor Robert H. Goddard, who later invented and fired the first liquid-fuel rocket, at a time when no one else took him seriously.

In 1915 Goddard sent a paper to the Smithsonian that Dr. Abbot read and thought was the best presentation of a research project he had ever seen. Dr. Abbot took it to Secretary Walcott and Goddard got a \$5,000 grant that enabled him to carry on his work.

After Secretary Langley's death the Institution became involved in an embittered feud with Orville Wright about the merits of Langley's airplane vis-a-vis the Wright Brothers' *Kitty Hawk Flyer*. Mr. Wright sent his craft to an English museum on permanent loan and it might not have come to the Smithsonian if it had not been for Dr. Abbot's persistent efforts after he became Secretary. Finally he wrote an article in the 1942 Smithsonian Annual Report that pleased Wright, and the next time the two men met Wright warmly shook Abbot's hand and said he felt friendly again towards the Institution. A few years later the *Kitty Hawk Flyer* was presented to the National Museum. Earlier, as Assistant Secretary, Abbot had obtained the *Spirit of St. Louis* by sending Charles A. Lindbergh a congratulatory, plane-petitioning cablegram which greeted him on his arrival in France.

Written Works

As editor-in-chief of the Smithsonian Scientific Series, he wrote two volumes and supervised publication of 10 others by Smithsonian staff and associates for popular reading. He also wrote a souvenir guide to the Smithsonian, and reorganized the Smithsonian editorial department.

Dr. Abbot's book *The Sun* first appeared in 1911. In it he advocated the theory that the photosphere of the sun is not a cloud of liquid particles as some had theorized but is entirely gaseous. In 1927 he co-authored *Elements of Astronomy*. He also wrote *The Earth and Stars* (1925, 1947); *Every Day Mysteries* (1923), a book of scientific stores for young people, and *The Sun and the Welfare of Man* (1928). He wrote several privately-printed booklets including *Retold Tales*; another titled *Uncles*, which dealt with his boyhood, and *The Foundation of a Glorious Hope*, one of several lay sermons he delivered. His autobiography, *Adventures in the World of Science*, was published in 1958.

In the *Annals of the Astrophysical Observatory*, he gave results of 11 years of his solar radiation study at four widely separated high-altitude desert field observatories.

Dr. Abbot had also received a degree in astrophysics from George Washington University as well as degrees from the University of Melbourne; Case School in Cleveland, and the University of Toronto.

Dr. Abbott was the oldest living member of the National Academy of Sciences, to which he was elected in 1915. He belonged to numerous other scientific organizations, including the Astronomical and Astrophysical Society of America, the Washington Philosophical Society, the Washington Academy of Sciences, and scientific organizations in France, Mexico and Germany. He was president of the Cosmos Club of Washington in 1931, and vice-president of the American Astronomical Society in 1932. He was elected to Sigma Xi in 1932.

He is survived by his wife, Virginia Andes, of the home in Riverdale, Md.

John E. Graf, Former Assistant Secretary, Dies

John E. Graf, retired Assistant Secretary of the Smithsonian and for many years an entomologist with the United States Department of Agriculture, died November 24.

Born in 1889, Mr. Graf received his degree from Pomona College and began a career in economic entomology with the Department of Agriculture in 1911. With one brief interruption, Mr. Graf worked in the Bureau of Entomology until 1931. He specialized in truck crop insect investigations and directed field work in several areas of the South. In 1926 he was made senior entomologist and principal entomologist, and from 1928 to 1931 he served as Assistant Chief of the Bureau of Entomology.

Mr. Graf published in the field of entomology, and for many years served as editor of the field and truck crops section of *Biological Abstracts*.

In 1931 Mr. Graf became Associate Director of the United States National Museum, a bureau of the Smithsonian. In this capacity he assisted Alexander Wetmore in administering the National Museum. When Dr. Wetmore became Secretary of the Smithsonian in 1945, Mr. Graf became Assistant Secretary, a position he filled until his retirement in 1958.

Mr. Graf's primary contribution to the Smithsonian was in funding and management of scientific research and other programs. He was instrumental in securing funds which made possible the growth and new spirit of the Smithsonian following the second world war. Mr. Graf was made an Honorary Fellow of the Smithsonian at the time of his retirement in 1958.

Mr. Graf was a member of many organizations and learned societies, including the American Medical Association, the Association of Economic Entomologists, the Entomological Association of Washington, and the Washington Academy of Sciences (President, 1945-1946). He was a member of the Federal Horticultural Board of the United States Department of Agriculture from 1926 to 1931. He was a member of the Cosmos Club (President in 1943) and Sigma Xi fraternity and served on the National Arboretum Council.

Mr. Graf is survived by his wife, Dorothy Williams Graf, of the home address in Northwest Washington.

In order to give appropriate space to an account of Dr. Charles Greeley Abbot's accomplishments, some news items that originally were scheduled to appear in this issue of the Torch will appear instead in the next issue.