# Lamont Geological Observatory

*See* Science, *22 September 1967, for details about registration for the tour to the New York Botanical Gardens.*

". . . established to study, by appropriate techniques from physics, chemistry, biology, geology, astronomy and mathematics, the composition and structure of the earth, its history, the changes now taking place in it, and its relationship to the rest of the universe . . . and to perpetuate and increase man's knowledge of the earth by teaching students those subjects in which research is done at the Observatory."

Five years after Maurice Ewing, director of the Lamont Geological Observatory, was invited by Columbia University to establish instruction and research in geophysics, the late Mrs. Thomas W. Lamont, widow of the financier, gave to Columbia (in 1949) the Lamont Torrey Cliff estate atop the Palisades on the west side of the Hudson River in Palisades, New York.

The gift of this 125-acre, wooded estate, with its mansion and other buildings, proved a most important turning point in the university's geophysics program. It came at a time when a sheltered place was being sought. A program involving the use of seismographs and other sensitive instruments could not be carried out at Columbia's Morningside Heights campus in New York City. The metropolitan environment has too many interferences, including subway and traffic vibrations.

Lamont Geological Observatory carries on an extremely broad program of study of the composition and structure of the earth, its history, the changes now taking place in it, and its relationship to the rest of the universe.

Answers are sought to such questions as: How and when was the earth formed? The moon? The solar system? How were the earth's continents formed? Are new ones being created? Is the earth contracting or expanding? Is it heating up or cooling off? What was the origin of the earth's magnetic field? What is the precise shape of the earth?

While the Observatory neglects no avenue that might furnish a clue to the answers, it emphasizes oceanographic and ocean-bottom studies for several reasons. The oceans cover more than 70 percent of the earth's surface, and until the last quarter-century, that area has been all but neglected scientifically. Much of the present land surface, including most mountains, is covered by marine sediments. Similar sediments are continuously being deposited on the bottom of the sea, and what may be future land is now being developed.

The Observatory operates research vessels in this phase of the program. The famed veteran, *Vema*, which has traversed all of the oceans of the globe, is now on her 24th scientific voyage. The *Conrad* is on the 11th voyage in the service of Lamont.

Aboard these ships, instruments (many of them designed and built at Lamont) are used to measure the magnetic and gravitational fields, to make precision soundings, for seismic reflection and refraction determinations of the nature of materials beneath the ocean floor, for photographing the bottom of the sea, for determining the flow of heat through the ocean floor, and for studying the propagation of sound in the seas.

One of the important tasks at sea is the taking of cores of deep-sea sediment that has been laid down on the ocean beds by nature and has remained there undisturbed for ages. To a scientist studying the history of the globe, these sedimentary layers are like pages in a book. Several thousand cores have been taken; some are 70 feet long and some are from depths as great as 4½ miles.

An unexcelled seismograph station has been developed at Torrey Cliff. More than two dozen instruments, set up in subterranean vaults on solid rock, continuously detect and record earth waves over an exceptionally broad frequency range, ⅕ to 3.000 seconds. The Observatory also operates three other seismograph stations: at Sterling Forest, N.Y., 1850 feet deep in a mine at Ogdensburg, N.J.; and at St. Georges, Bermuda. A network of cooperating stations, equipped by Lamont and extending around the world, supply additional data.

Earthquake field investigations are being carried out in many parts of the world, such as Alaska, western United States, Iceland, and East Africa. Lamont has also placed a seismograph 2½ miles below the surface of the Pacific Ocean and 100 miles off the coast of California.

Research programs at Lamont are extended around the earth by means of expeditions on land and at sea. Seismic studies are carried out in many countries and on many islands. Regular research stations are operating in acoustics at Bermuda and in the Canary Islands, and in marine biology at St. John, Virgin Islands.

Programs and research facilities at Lamont include seismology, marine geophysics, submarine geology, marine biology, geochemistry, physical and chemical oceanography, atmospheric physics, polar studies, and lunar and planetary studies.

Lamont Geological Observatory has enjoyed remarkable growth both academically and physically, in the 18 short years since Mrs. Lamont gave her beautiful estate to Columbia University.

Eighty-six students were enrolled in the graduate-degree program during the 1966–67 academic year, compared with eight students when the Observatory was opened in 1949.

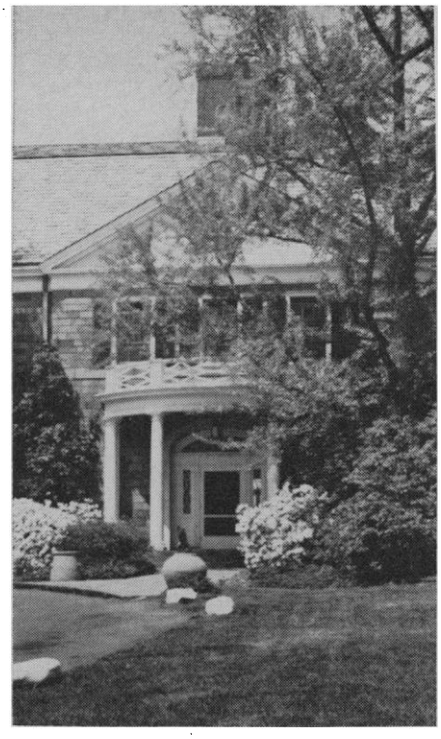
As of November 1966, 55 students had been awarded the Ph.D. and 26 students the master's degree. About half of the Ph.D. graduates are teaching in such schools as Yale, Brown, Princeton, Massachusetts Institute of Technology, Georgia Institute of Technology, Rensselaer, Colorado School of Mines, University of Hawaii, Columbia, University of Wisconsin, University of Arizona, University of Texas, University of Rochester, and California Institute of Technology.

Recognition of the quality of the Observatory's program is attested by the fact that at the 1966 meeting of the Amerian Geophysical Union, 6.5

percent of the scientific papers were presented by Lamont staff members and students. At the April 1967 meeting of the Union the number of papers presented by the Observatory personnel grew to 8 percent, and were presented in each of the disciplines covered by the Union.

The Lamont estate had four buildings and four residences, including the Lamont mansion, when Columbia received the property. In a very short time the mansion proved to be inadequate for all the personnel and equipment, and the Observatory embarked on a building program that brought the number of buildings to twelve and the number of residences to five. Plans are underway for the graduate section of the Geology Department of Columbia University to move to the Lamont campus.

The Lamont Geological Observatory has been able to carry on the major portion of its research and development work through contractual arrangements with grants from United States government agencies such as the Office of Naval Research, the National Science Foundation, the Atomic Energy Commission, the National Aeronautics and Space Administration, and the Air Force Cambridge Research Center. Columbia University has provided the funds for the important and basic activities including the supplying of professional, research, and administrative staffs.



Entrance to Lamont Hall, one of the original buildings of the Lamont Estate. It is now used to house the library, the Main Seminar Room for the Observatory and the office of the Director and his staff.

Lamont Geological Observatory has earned an enviable reputation with government agencies for the worthwhile results obtained for them from its research and related activities—activities performed efficiently and at the minimum cost.

The magnitude and scope of this highly desirable research work at Lamont has been expanding year by year as more and more interest has been directed toward oceanographic and planetary matters.

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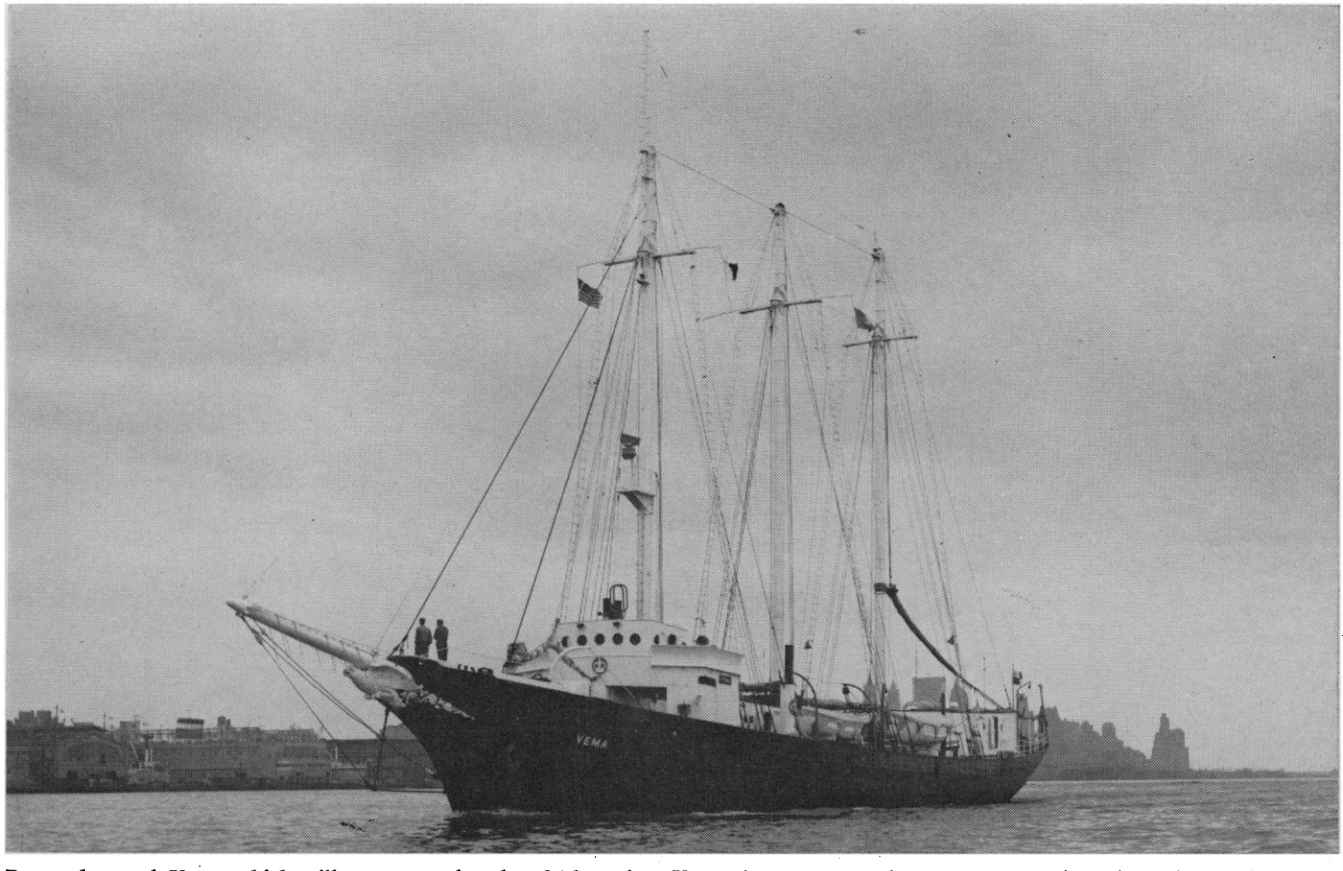


Research vessel *Vema* which will soon complete her 24th cruise. *Vema* has covered about 560,000 miles of track, making geophysical-oceanographic records while underway, and has made over 4000 separate oceanographic-geological-biological stations while stopped.