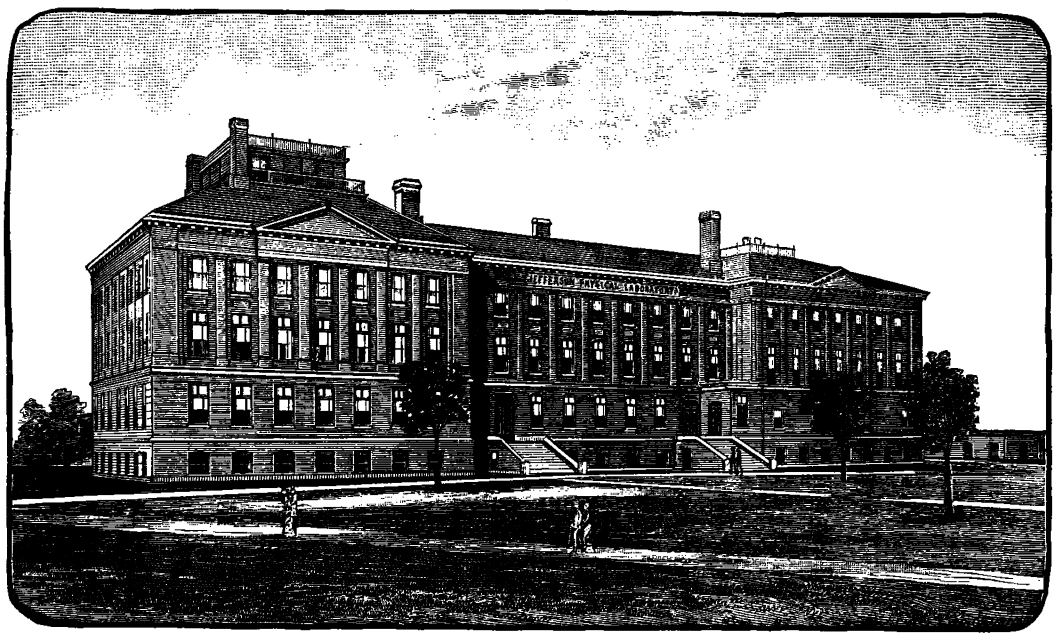
profound truths from the partisan testimony of each witness.

The most expensive and important of the organizations studied by the commission is the signal-service; and considerable interest attached to the testimony of Professor Abbe, himself a member of the National academy of sciences, as it was hoped he would contribute facts favoring its transfer to a civilian scientific bureau. It is difficult to believe that he does not appreciate the strong arguments on this side of the question; but, like most government employees, he has chosen to consider the commission as an aggressive body, inquisitive as to whether the laws of congress have been properly carried out by his branch of the executive: he has therefore not touched upon questions of the general policy of the federal government, but has simply defended the present administration of the signal-office as being quite efficient and economical, and is especially strong in his defence of Gen. Hazen. He thus leaves it to his examiners to penetrate to the core of the matter, and to show that the proper interpretation of all and even of his own testimony affords an unanswerable argument against a purely military administration, and rather in favor of a purely civilian business and scientific one. The committee has evidently failed to obtain an exposition of the arguments for and against the present management of such institutions as the naval observatory, the signal-office, nautical almanac, geodetic survey, etc.

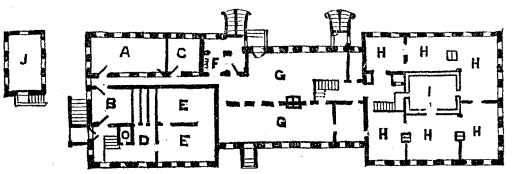


THE NEW PHYSICAL LABORATORY AT HARVARD COLLEGE.

THE JEFFERSON PHYSICAL LABORATORY.

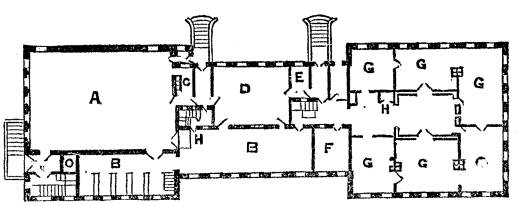
THE Jefferson physical laboratory, which has recently been completed at Harvard university, is a three-story brick building with a basement, the floor of which is nearly on a level with the surface of the ground. The building is 209.4 feet long. The two wings are 67 feet square, and are connected by the main walls of the building, which are 46.8 feet apart. The ground-plan thus consists of two squares connected by a rectangle. The longest line of the laboratory runs very nearly east and west: there is therefore a great southern exposure, with no

trees or buildings near the laboratory to interfere with the employment of sunlight for optical purposes from dawn to twilight. The western wing contains no iron, all the gas-pipes and steam-pipes being made of brass. This wing has a separate entrance, and can be isolated from the eastern wing, which contains the large lecture-room and the elementary laboratory. The vibrations resulting from the movement of classes are thus obviated in the western portion. Each room in the basement and first floor of the western end is provided with brick piers, which are so arranged that instruments placed upon the south-west or the north-west corner piers can command long lines of sight east and west, and north and south. In the centre of the western wing, below the floor of the basement, is a constant-temperature room. This room is at the base of a tower, the walls of which are at least a foot from the main walls of the building. This tower rises to the roof, from which, however, it is entirely separate. In this way the effect of the wind is prevented from communicating vibrations to this inner tower. In the tower are placed large shelves of slate, which serve as piers on the second and third floors. The arrangement of rooms in the western wing is such that any room can be entered from the main hall without going through any other room. Moreover, two or more rooms can be thrown together if any experiment demands such an arrangement. There is gas and water in each room. Provision is also made for a line of sight entirely within the building nearly two hundred feet long.



BASEMENT.

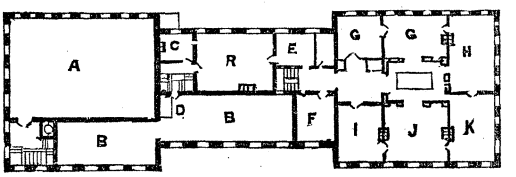
A, workshop; B, forge; C, battery-room; D, fire-room; E, coal; F, mercury-room; G, receiving-rooms; H, special investigation rooms; I, constant-temperature room; J, engine-room.



FIRST FLOOR.

A, space under lecture-room; B, first-story cabinets; C, preparation-room; D, recitation-room; E, professor's room; F, balance-room; G, special investigation rooms; H, elevators.

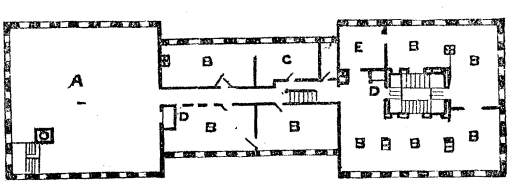
The portion between the two wings is devoted to recitation-rooms and cabinets. A lecture-room capable of seating an audience of three hundred is placed on the first floor of the eastern wing. Immediately over it is the large elementary laboratory sixty by sixty feet. Connected with the latter are several rooms for special investigations, which do not require the great steadiness of the western end. Immediately beneath the lecture-room is the workshop, together with a battery and a mercury-room. Power is conveyed to the workshop through a large tunnel which connects with an outside engine-house, in which is placed a twenty-five horse power engine and a seven horse power gas-engine, together with two dynamo-electric engines.



SECOND FLOOR.

A, lecture-room; B, second-story cabinets; C, professor's room; D, elevator; E, professor's room; F, library; G, optical rooms; H, Rumford lecture-room; I, sound; J, special investigation room; K, chemical laboratory; R, recitation-room.

The ground upon which the laboratory is placed consists of gravel, with a substratum of clay, which, however, is below the lowest foundation of the laboratory. The nearest street is more than three hundred feet distant, and it is found that no prejudicial vibrations are communicated to the piers. A vessel of mercury placed upon them, however, shows slight crispations and vibrations. The shelves placed in the isolated tower are steadier than the piers. This is probably due to the effect of the outside walls of the building in cutting off the surface vibrations, and suggests, that, if the future builders of physical laboratories desire ideal steadiness, they should sink walls outside



THIRD FLOOR.

A, elementary laboratory; B, special investigation rooms; C, library; D, elevators; E, photographic chamber.

the building, and build large masses of stone or brick upon which piers for delicate instruments could be placed. The conditions for steadiness, however, in the Jefferson physical laboratory, are fulfilled sufficiently for practical purposes.

The laboratory, together with its heating and lighting arrangements and engines, cost a hundred and fifteen thousand dollars. This sum was given by Mr. Thomas Jefferson Coolidge, on condition that seventy-five thousand dollars more should be raised for maintaining the laboratory. Many friends of the university contributed to this income fund.

The laboratory is named in honor of Thomas Jefferson, the ancestor of Mr. Coolidge. Jefferson, while president of the United States, evinced great interest in the promotion of university education in America, — an interest which took a practical form in the foundation of the University of Virginia; and the seed thus sown, it will be seen, bears fruit even unto this day. JOHN TROWBRIDGE.

EVIDENCES OF BEACHES IN THE CINCINNATI GROUP.

THE presence of old beaches above present water-level is readily perceived on many modern lake and ocean margins, notably around Great Salt Lake and on the Peruvian and Chilian coasts of South America. The evidence of similar beaches in geological groups cannot be considered so decisive, nor is it so conspicuous.

That most of the strata of the Cincinnati group were deposited in deep water is probable. They contain many fossils whose modern relatives live in deep seas, and it is not likely that it was different with the ancient forms. Brachiopods, crustaceans, bryozoans, polyps, are all inhabitants of comparatively deep water, at least; and these forms are found in extraordinary abundance in the Cincinnati group.

Two apparently well-defined shore-lines have been noticed in the rocks in the vicinity of Cincinnati. One of these was first referred to by Dr. Locke some forty years ago. It crops out about three hundred feet above low-water mark, and is characterized by the dumb-bell fossil known as Arthraria. It is apparently to this horizon that Miller refers in the *Cincinnati quarterly journal of science*, i. 64, where he speaks of wave-lines in the rocks. He says, —

"These wave-like rocks are composed in a very large part of fragments of crinoids, principally of the Heterocrinus simplex, and appear to have been formed by the action of the waves in first breaking to pieces the animal skeletons, and then leaving them in ridges, as if to mark for all future time the course of the waves. These rocks are found in all the hills about Cincinnati, and as far east as Plainville [nine miles]. A number of fossils are found below these rocks that have thus far not been found above them; and, on the other hand, many have been found above that have not been found below. . . . The fossils which are common to both elevations comprise more than half of all those found below these rocks. And yet, on further examination, it may appear that the causes which led to the formation of these waves in the rocks, also caused a considerable change in the animals which inhabited the ocean at that time."

Here the probable existence of a shore-line is indicated. It seems to mark one of those periods of elevation which occurred during the deposition of the strata. The fact that many fossils are found above which are not common below, would indicate a serious disturbance of conditions, — a change which caused the extinction of many previously common species, and allowed the introduction of a few entirely new ones.

It is at about this horizon that rocks bearing marks of surface water-washings, and evident traces of the action of trickling water, are found. There are also indications in the rocks of the rippling of water, such as could occur only along the margin of a shallow sea. These marks have been described as Algae under various names, but their true character has been shown by comparing them with modern marks of a known origin.

A second ancient shore-line, as it appears to be, crops out at various points in the vicinity of Cincinnati. Probably the best exposure is at Ludlow, Ky., along the Ohio River, opposite the city. Professor Orton, in speaking of the waved structure of the rocks, refers to this locality as follows: [1] —

"The rocks exhibiting this structure at the point named [river-quarries] are the most compact beds of the fossiliferous limestone. The bottom of the waved layer is generally even, and beneath it is al-

ways found an even bed of shale. The upper surface is diversified, as its name suggests, with ridges and furrows. The interval between the ridges varies, but in many instances it is about four feet. The greatest thickness of the ridge is six or seven inches, while the stone is reduced to one or two inches at the bottom of the furrow, and sometimes it entirely disappears" (see figure).

[1] Geology of Ohio, vol. i. p. 377.