THE ARBUTHNOT MUSEUM, PETERHEAD.

THE visitor to Peterhead in past years may have had his or her attention directed to the Arbuthnot Museum, and may have ventured into the hall which then contained the very interesting but well-mixed collection.

The founder of this museum, Mr. Adam Arbuthnot, was born in September 1773. During his years of business as a merchant in Peterhead, and after he retired, he kept gathering at objects of antiquity and natural history, and amassed an immense and valuable collection, all of which he bequeathed to the town at his death in 1850. Some years later the museum of antiquities, minerals, &c. collected by the members of the Peterhead Institute, was added. This last contained a very fine and extensive collection of local shells by the late Mr. Dawson, who was a schoolmaster in Cruden. Since then many smaller but important donations have been made, notably by whaling captains. The Rev. Mr. Yuill, late Free Church minister of Peterhead, contributed the large majority of the invertebrate fauna.

It had become apparent that better accommodation was required, and a complete revisal of the whole collection. There is no necessity here of detailing how this was gradually arrived at. With bazaars, and by means of a handsome contribution made by Mr. Carnegie, Peterhead was enabled to adopt the Free Library Act, and on a site obtained, a very handsome and suitable building was erected, with provision for a free library and reading-room, museum, and art gallery. The two rooms devoted to the museum are large and well-lighted, and the collection has been completely rearranged. The whole building was opened on Wednesday, October 11.

The museum is now in a very different condition. One of the rooms contains the antiquities and ethnographical exhibits, the other the natural history collection. Local and foreign objects have been separated in both rooms as far as was possible. And now the visitor may begin in the antiquities room and see the stone implements, the urns, and the mediæval finds of a local character, and the curiosities from different parts of the world, all placed in a rational order. The rich collection of domestic and other articles from Greenland are all together at the far end of the room. A very valuable collection of coins is also arranged in excellent order in this room. It may be interesting to note that the British coins are so arranged in movable glass panels that the visitor can see both sides by turning the panels round. The ancient swords, African spears, and the like have been grouped on the walls. Not only is the room in the manner of its arrangement worthy a visit, but many of the objects are of considerable value and interest.

The same is true of the larger natural history room. There is a very good collection of minerals, polished granites from many localities, local seaweeds, lichens, mosses, and the invertebrate division of the zoological collection is also rich in many of the orders. These specimens are all arranged in large double-floor cases, a feature in which is the upright middle case. Spirit and branching specimens are thus shown to an immense advantage from both sides. Lightness of effect is secured by using plate-glass shelves.

It may be interesting, moreover, to point out that one or two of the Sertularians and a Ray's bream have been obtained, prepared, and presented by Mr. C. W. Peach.

The fishes are arranged in a wall case, and surmounted by a group of the "saws" of the saw-fish. The amphibia and reptiles are arranged in a corresponding case, which is surmounted by turtle shields. The crocodiles, &c., are arranged on the wall near this, above the very handsome case of birds. In this last case, as in the rest of the museum, all the foreign specimens are made to keep company. The mammals are arranged in one of the old cases, and near them all the Greenland specimens are grouped together. Plate-glass shelves have been used throughout.

Very many valuable objects claim the attention in this section. There is a group, for instance, of deers' horns (mostly red deers') over the door, which have been picked up in the mosses around Peterhead, and which measure more in diameter than the recent ones. Among the fishes are many that could be mentioned as occurring at Peterhead. There are several fœtuses of whales, walruses and seals, including a large one of the Greenland whale. Two very nice cases, exhibiting the characteristics of foxes and badgers, are the work of the Aberdeen naturalist Mr. Sim. A similar case of sea birds was made by a local naturalist, Mr. McBoyle, from whom, too, many of the local birds have been procured. It is to be hoped that some of the groups, such as the Crustacea, will not be lost sight of by the members of the Buchan Field Club, whose interest in the museum should be a direct and helpful one.

This is not the only collection in Aberdeenshire. It has been my pleasure to meet some enthusiasts who have more or less exhaustive collections of antiquities, insects, birds, &c.; but it is to be regretted that there is no good public museum in Aberdeen itself; its situation is one that would be unequalled almost in interesting such collectors in a very large district. Moreover such a museum, if ever formed, would require to provide for a good technical display illustrating agricultural, fishery, and granitic industry. ALEXANDER MEEK.

THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

THIRTY years ago Dr. William Barton Rogers, the then Director of the Geological Survey of Virginia, and a Professor in the University of that State, founded the Massachusetts Institute of Technology, Boston. Dr. Rogers has since died, but the Institute has grown, and is now the largest scientific and technical school in the United States, and one of the largest in the world. By the catalogue of 1892–93, the number of students was 1060, and the number of teachers 125.

An account of the character, equipment, and work of the Institute has recently been published, and from it the following facts have been obtained. The prospectus is illustrated by a number of fine pictures, three of which have been sent to us for publication.

The Institute is remarkable for the great variety of its courses. In it are taught the sciences and their applications to the arts, the studies being divided into thirteen four-year courses, as follows:—(1) Civil engineering, including railroad engineering, highway engineering, bridge building, and hydraulic engineering; (2) mechanical engineering, including steam engineering, mill and locomotive engineering; (3) mining engineering and metallurgy; (4) architecture; (5) chemistry; (6) electrical engineering; (7) biology; (8) physics; (9) general studies; (10) chemical engineering; (11) sanitary engineering; (12) geology; (13) naval architecture. Agriculture is not included in this list, on account of its being provided for in a State College at Amherst.

In the four years required for graduation, it is sought:—

(1) To make the pupil observant, discriminating, and exact.

(2) To develop in him a taste for research and experimentation on the one side, and for active exertion on the other.

(3) To give him the mastery of the fundamental principles of mathematics, chemistry, and physics, which underlie the practice of all the scientific professions.

(4) To equip him with such an amount of practical and technical knowledge, and to make him so familiar with the special problems of the particular scientific profession at which he individually aims, as to qualify him immediately upon graduation to take a place in the industrial order.

The chief and dominating feature of the Institute, from the material point of view, consists of its numerous large and well-equipped laboratories. The buildings of the Institute, in addition to drawing, recitation, and lecture rooms and libraries, comprise eight laboratories, or groups of laboratories. The Rogers Laboratory of Physics comprises seventeen separate rooms. It includes a laboratory of general physics devoted to instruction in the principles of physical measurement, a laboratory of electrical measurements, devoted chiefly to advanced electrical work; a laboratory of acoustics, one for optical work, and another for photography. In addition to these, there is a dynamo-room and several laboratories of electrical engineering.

The dynamo-room (Fig. 1) is provided with a Westinghouse engine of 75 horse-power, the sole use of which is to furnish the power to drive the plant of dynamos. This plant, besides a number of smaller machines, comprises a 500 light alternating current Thomson-Houston dynamo, with transformers, a 150 light Edison dynamo, a 200 light Thomson-Houston direct current dynamo, a 60 light Weston dynamo, a 3 arc-light Brush dynamo, a United States 300 ampere low voltage dynamo for electrolytic work, and a Siemens' alternating arc-light dynamo. From time to time other large machines are temporarily placed here for purposes of study by the students. The wires from

this room are carried to all parts of the building for experimental purposes, as well as for use in illumination.

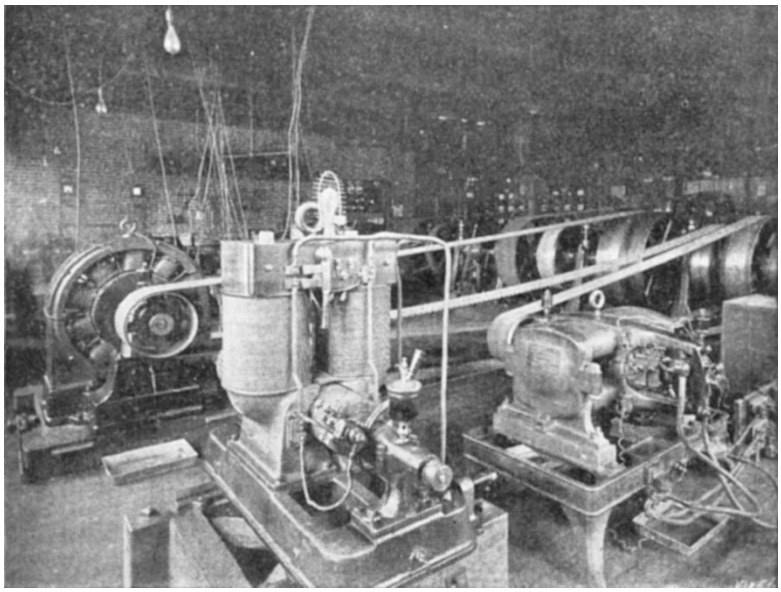

FIG. 1.—Dynamo Room.

The Kidder Chemical Laboratories are just as well-equipped as the Rogers Laboratory of Physics. They comprise eighteen laboratories, four lecture-rooms, a library and reading-room, balance-rooms, &c.; in all, thirty rooms. There is a laboratory of general chemistry with 133 working tables, each of which has under it three complete sets of drawers and cupboards; a laboratory of analytical chemistry, with 108 benches; an organic laboratory having benches for twenty-six students; two laboratories of sanitary chemistry, in which, since 1887, 10,000 samples of water have been analysed for the Massachusetts Board of Health; a laboratory for gas analysis, and three for industrial chemistry, besides a number of smaller ones.

The John Cummings Laboratory of Mining Engineering and Metallurgy comprises laboratories for milling, for concentrating, and for smelting ores, as well as for testing them by an assay and by the blowpipe, and a library comprising the most important literature of the subject.

The engineering laboratories comprise laboratories of steam engineering, of hydraulics, a laboratory for testing the strength of materials, and a room containing cotton machinery.

The most prominent feature of the steam laboratory (Fig. 2) is an Allis triple-expansion engine, having a capacity of about 150 horse-power when running triple, with 150 lbs. initial pressure in the high-pressure cylinder.

The laboratory also contains a 16 horse-power Harris-Corliss engine, and an 8 horse-power engine used for giving instruction in valve-setting. In addition to these, there is a great variety of apparatus, including condensers, calorimeters, injectors and ejectors, steam pumps, &c., directly connected with studies in steam, also apparatus for testing the efficiency of transmission of power and for measuring the power transmitted.

The hydraulic laboratory (Fig. 3) contains a closed tank, 5 feet in diameter and 27 feet high, extending from the basement under the lower floor to the upper part of the room on the second floor. This is connected with a stand-pipe, 10 inches in diameter and over 70 feet high, so arranged that the water may be maintained at any desired point, glass gauges along the stand-pipe serving to measure the height. The stand-pipe is connected with a steam pump, with a rotatory pump, and with the city supply. On the sides of the large tank are the connections for the various hydraulic apparatus, including apparatus for measuring the flow over weirs; through various sizes and shapes of orifices; through hose-nozzles; through different sizes of pipe, with the several varieties of obstructions that occur—namely, diaphragms, couplings, elbows, T's, bends, valves, &c. Also connected with the tank, or with a centrifugal pump, is a Swain turbine, so arranged that measurements can be made of the power transmitted under various heads and with different openings of gate.

The most important feature of the biological laboratory of the Institute is the opportunity of studying ferments, fungi, algæ, bacteria, and other low forms of life. Courses are also provided in general biology, microscopy, comparative anatomy and embryology, physiology and histology.

The Institute possesses a laboratory of mineralogy, lithology, structural geology, and economic geology, but it is neither so extensive nor so well equipped as most of the laboratories already named.

A praiseworthy feature of the Institute's curriculum is that during the last term of his course every student who is a candidate for a degree spends a large portion of his time in the preparation of a thesis upon some chosen subject. This is always of the nature of an experimental research, and may be either purely scientific or technical in its nature. In many cases the results of this work have been of such a character as to merit

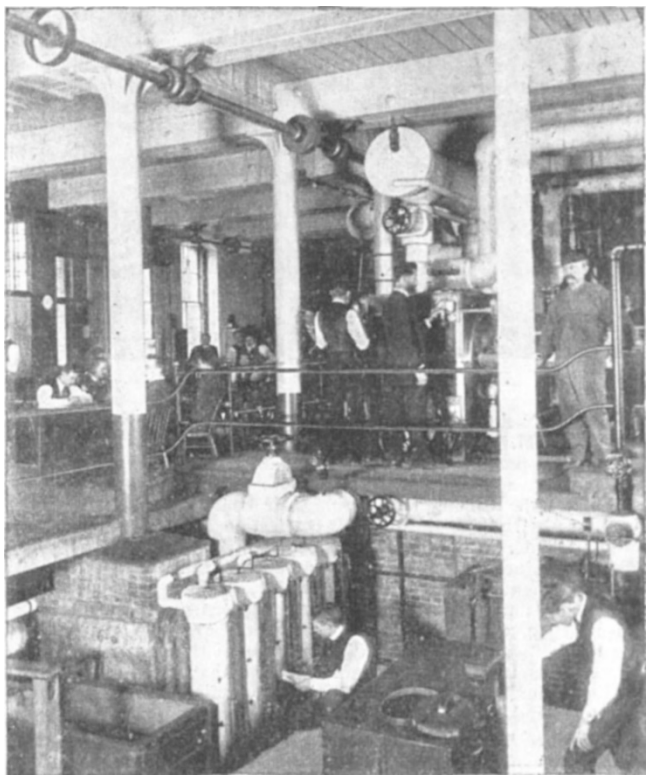

FIG. 2.—Engineering Laboratory: an Engine Test.

publication, and a considerable number of such papers have appeared in scientific and technical journals.

A high value is attached to the thesis work; and rightly. In it the student is placed in the attitude of an independent investigator. He is thrown to a large extent upon his own resources in devising methods of investigation and in finding means of overcoming the difficulties that always arise in original work. Such individual aid is given to each student as is necessary to keep him from too great loss of time from using wrong methods of procedure, without, on the other hand, giving him such specific directions as would entirely deprive his work of originality. He thus acquires a knowledge of the patience, care, and time which it is usually necessary to spend upon the experimental solution of any new and untried problem. This early training of investigators has produced excellent results. A register of the publications of the Institute and of its officers, students, and alumni, between 1862 and 1882, was compiled by

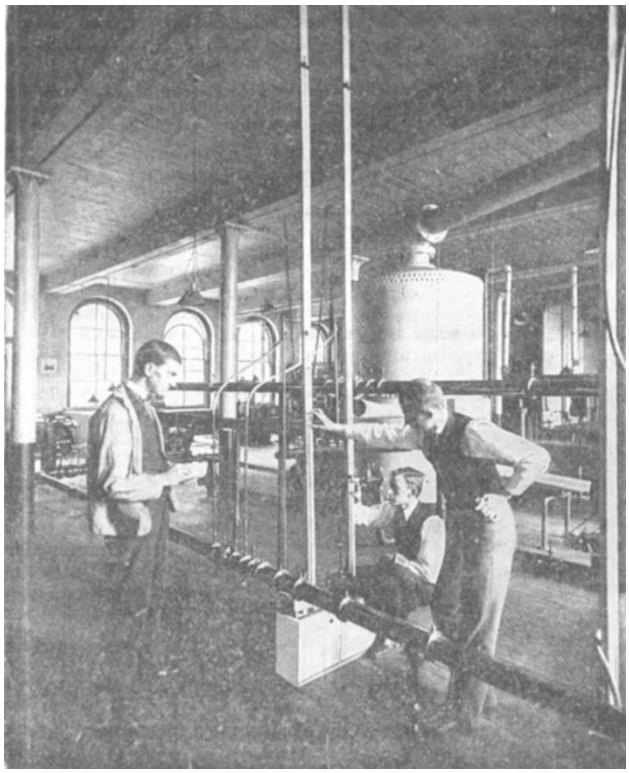

Fig. 3.—Hydraulic Laboratory.

Prof. W. R. Nichols, and has been brought up to date by the late Prof. L. M. Norton and Prof. A. H. Gill. The list includes books, pamphlets, reports, contributions to periodicals—everything, in fact, except contributions to daily newspapers—made by the the teaching staff during their connection with the school, and by students during their connection with the school and in after life. As Prof. Gill remarks, no truer index of the value of an educational institution can be found than the work which its alumni have done and are doing, and when we say that the total number of titles of communications given in the list is nearly 2,900, thirteen hundred of which have been added since 1888, it will be agreed that the system of training at the Massachusetts Institute of Technology is one that gives a love of investigation to the students; and to the man of science this desire to extend natural knowledge should be the end and aim of all scientific education.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—At a meeting of the Junior Scientific Club, on Friday, October 27, Mr. M. D. Hill, of New College, was elected President for the current term. Mr. E. S. Goodrich exhibited some recent additions to the University Museum, including a specimen of Palæospondylus, a specimen of Indris-brevicandatus, and the brain of "Sally," the chimpanzee, who was so well known at the Zoological Gardens. Mr. Wynne-Finch, of New College, read a paper on mining; and Mr. Gordon, of Keble College, read a paper on the effects of temperature on the incubation of eggs.

The Ashmolean Society held a meeting on Monday, October 30, when Mr. A. G. Vernon Harcourt read a paper on the properties of ferrous chloride, and Dr. W. B. Benham one on the effects of sedentary life on certain annelids.

The Junior Scientific Club seems to have ousted the older and more senior Ashmolean Society almost completely. At the meetings of the latter, which offers communications of at least equal, perhaps of greater, interest than the Junior Society, the attendance seldom reaches a dozen, and of these a large proportion consists of ladies who are more or less directly interested in the lecturer. The attendance at the Junior Scientific Club, on the other hand, is always large, and frequently exceeds fifty. The reason of this disparity is not easily found. Some people attribute it to the lesser formality of the proceedings of the younger society, and to the fact that smoking is permitted during the meetings.

The Sherardian Professor of Botany announces a course of six lectures on forestry, to be given by Dr. J. Nisbet, at the Botanic Garden, daily from Monday, November 6, to Saturday, November 11, inclusive.

CAMBRIDGE.—The Engineering Laboratory Syndicate ask for a grant of £1000 to enable them to complete the buildings required for the accommodation of the department. From private sources nearly £5000 have been subscribed for the purpose, but this is insufficient for the whole of the work in contemplation. Prof. Ewing reports that no less than seventy-four students have entered for courses in engineering during the present term; and it is very desirable that their work should not be hampered by delay in providing the necessary rooms for their accommodation. It had been hoped that subscriptions towards so valuable an extension of the scientific equipment of the University would flow in liberally, but the stream of benefaction seems for the present to have dried up.

The scheme for examinations in agricultural science will come before the Senate for decision on November 9. Already a note of dissent has been sounded by a well-known theological graduate.

Mr. R. A. Sampson, Fellow of St. John's, has been appointed Professor of Mathematics at the Newcastle College of Science.

SCIENTIFIC SERIALS.

L'Anthropologie, tome iv. No. 3.—The current number contains four papers of much interest. Dr. R. Collignon contributes an article on the proportions of the trunk among the French, whom he divides into three classes: (1) the Celts, in the sense in which Broca used that term, that is to say, a short, dark, brachycephalic and mesorhine people, such as those found in Auvergne, Limosin, and the centre of France generally; (2) the tall, fair, dolichocephalic Kymris, found in the north-eastern or Belgic departments of France; and (3) those who are really cross-breeds. The measures of the trunk are five in number:—(1) The total height, in the sitting position, from the inter-clavicular notch to the seat; (2) the maximum bi-acromial diameter; (3) the maximum bi-humeral diameter; (4) the maximum bi-iliac diameter; (5) the maximum bi-trochanteric diameter. The following measures of the thorax are also taken: (1) the distance from the superior border of the clavicle to the inferior border of the false ribs, measured on a perpendicular line passing over the nipple; (2) the transverse width, and (3) the antero-posterior width, at the height of the nipples; (4) the circumference just below the nipples; (5) the circumference about 3 c.m. below the nipples. Observations were made on sixty Celts, seventy Kymris, and eighty Celto-Kymris. It appears that there is a regular gradation between the three classes. Among the brachycephalic Celts, the trunk and thorax are shorter than amongst the dolichocephalic Kymri, whereas in all other respects the measurements of the Celt exceed those of the Kymri. The people of mixed blood occupy an intermediate position. When the total height or the length of the