

America, and incorporated in the lectures. In my next and concluding notice I shall touch on the further developments if space permits.<sup>1</sup>

GEORGE FORBES

(To be continued.)

#### CITY AND GUILDS OF LONDON INSTITUTE

THE Fifth Annual Report of the Council of this Institute, which was presented last week to the Governors by the Lord Chancellor, gives evidence of marked progress in all departments of the Institute's operations. During the last five years, the advance made in this country in providing technical schools of various grades has been very great, and brings us educationally within a measurable distance of France and Germany. Much praise is certainly due to the City Companies for the very energetic manner in which they have set about giving effect to the important objects they have undertaken. The Technical College at Finsbury and the Central Institution at South Kensington are important additions to the educational establishments of the metropolis. That the Finsbury College has supplied a great want is shown by the rapid increase in the number of students during the two years since it was opened. The number of evening students might have been expected to be large, because in very few places, if in any, do evening students have the same advantages as at Finsbury of obtaining practical instruction in physics and mechanics. But the great success of the College is shown in the increasing number of its day students. In little more than two years the number has increased from 30 to 148; and nearly all these students are in regular attendance throughout the whole day, and go through the complete course of instruction as laid down for them in the programme. Some changes have taken place in the staff of the College in consequence of the opening of the Central Institution. Mr. Philip Magnus has been relieved of the duties of Principal, which he temporarily undertook in addition to his other duties as organising Director of the Institute, and Profs. Ayrton and Armstrong have resigned the Chairs of Physics and Chemistry for similar positions at the Central Institution. The appointment of Dr. Silvanus Thompson as Principal and Professor of Physics at Finsbury promises well for the future of the College, and the Council have been well advised in this selection. The Professorship of Chemistry is still vacant.

The Central Institution, which is to form a kind of technical university, was formally opened in June last, but, as generally happens, the completion of the fittings has occupied more time than was anticipated, and the Institution is consequently not yet in working order. The Prince of Wales, who has shown great interest in the progress of the Institute, issued an appeal to the Lord Mayor and to the Masters of the several Companies for additional funds to defray the cost of the fittings, which brought in over 17,000*l.* It may be expected, therefore, that this Central College will be very completely furnished with all the necessary appliances and apparatus for scientific and technical instruction.

The Council of the Institute refer with satisfaction to several passages in the Report of the Royal Commissioners on Technical Instruction, showing the great need in this country of improved facilities for higher technical teaching. It is a common error, which the building in South Kensington will help to correct, that technical education has reference to artisans only, and that the improvement of the skill of the working man is the great desideratum in the commercial interests of the country. But this is not so. The difference between foreign countries and our own in the facilities afforded for the

education of artisans is not so marked as in the opportunities for the higher education of masters and managers of works.

But the City Guilds Institute, whilst giving prominence in its scheme to the provision of this higher education at its Central Institution, has done a great work in assisting in the establishment of evening technical schools in all the principal manufacturing centres of the kingdom, by means of its system of technological examinations. The Director's special Report on this part of the Institute's work is full of detailed information as to the increase in the number of candidates and of subjects of examination, and is supplemented by remarks of the examiners on the causes of the failures of the candidates. The percentage of failures is decidedly high; but the Institute very wisely insists upon a high standard of excellence, so that its certificates may be accepted by masters and employers as proof of the efficiency of those who hold them. In many crafts, this would be impossible, if the certificates were awarded on the results of a written examination only; but the practical tests which have this year been added afford a guarantee, which would otherwise be wanting, of the technical skill, as well as of the knowledge of the candidates. In the examination in "weaving," for instance, the candidate is required to design an original pattern, to prepare it for the loom, and to weave it in suitable material, besides answering questions on the analysis of patterns, the structure of the different kinds of looms, &c. In mine surveying, also, a practical examination was last year held at the Pease's West Collieries, in which the candidates were engaged, with the examiner, in surface and underground work during the three days. Whilst the Institute's examinations are thus conducted there can be no doubt of their efficiency, and of their affording a valuable supplement to those of the Science and Art Department. Most of the Institute's examiners complain of the candidates' want of skill in drawing; and it is satisfactory to note that the attention of the Education Department has been called to this general defect in the education given in our primary schools, and that it is likely to be remedied by the provisions for teaching linear drawing throughout the Standards contained in the New Code for 1885.

The Report of the Institute concludes with an appeal for additional funds. If the Council are to develop the work they have begun they require a much larger income than they now dispense. A good beginning has been made, but it is little more than a beginning, in the establishment of technical schools in this country. Leicester, Nottingham, Sheffield, and Manchester have received some assistance from the Institute; but there are many manufacturing towns still requiring help, and the wants of the metropolis are by no means satisfied. It is to be hoped, therefore, that the appeal of the Council, backed by the powerful support of the Lord Chancellor, will meet with a ready and adequate response.

#### THE PEABODY MUSEUM AT NEW HAVEN, U.S.

THE accompanying illustration of this fine museum is reproduced from *Science*. The Peabody Museum, Mr. Ingersoll informs us, stands on the corner of Elm and High Streets, just without the *campus* of Yale College. The building is due to the liberality of George Peabody, who gave a sum of money, in 1866, to erect a house for the collections. Thanks to the financial prosperity of Massachusetts, the bonds for a hundred and fifty thousand dollars had greatly increased, and those set aside for the first wing of the building had become worth a hundred and seventy-five thousand dollars when the trustees began to build. With that sum they have erected one of the finest buildings, for its purpose, in the United States—a lofty and ornamental structure of red brick and cream-coloured stone, whose broad and numerous windows

<sup>1</sup> Corrections to first notice in issue of March 19:—For *asphasia* read *aphasia*. P. 462, line 41 of second column, for *a few seconds*, read *for a few thousandths of a second*. P. 463, line 35 of first column, for *without* read *with*.

express the desire of the investigators within for all the light they can get.

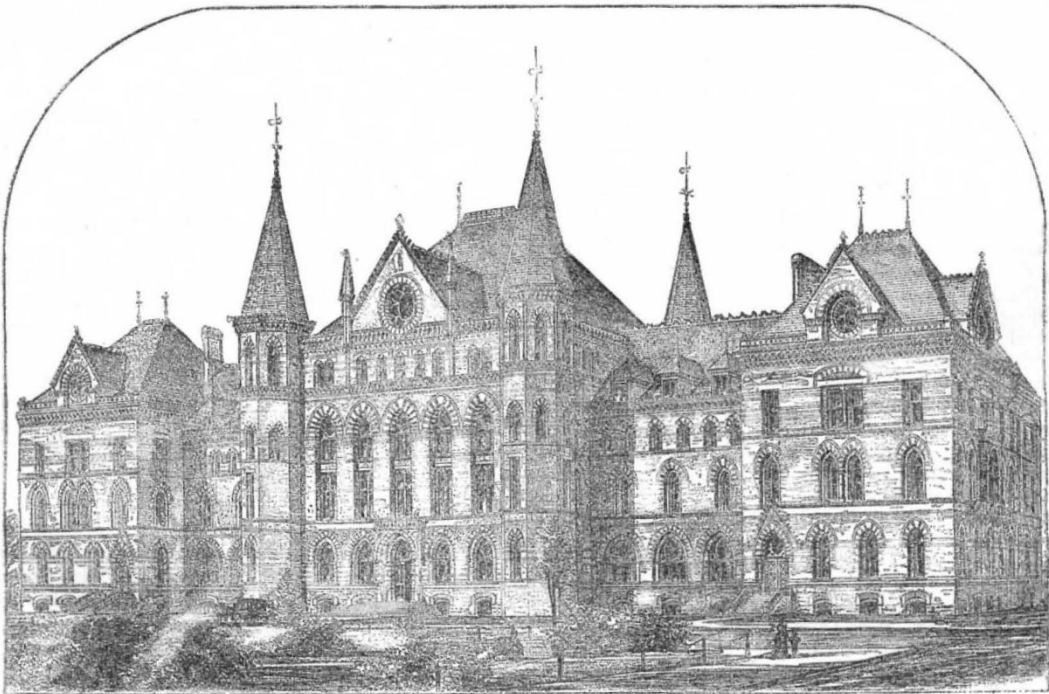
Entering the basement-floor we find the possessions of the U.S. Fish Commission, deposited for sorting and examination under the eye of Prof. A. E. Verrill, who is chief of the zoological part of the museum, or by some of his associates. In another part of the basement, Prof. O. C. Marsh keeps "greatest store" of fossils, cleaning the gigantic bones from Rocky Mountain quarries preparatory to study and display. Considerable palæontological property of the U.S. Geological Survey is under inspection here also.

Only favoured visitors go to the basement, or care to go. The public entrance is above, opening underneath a magnificent rose-window into a spacious court with tiled floor, and walls of variegated bricks. This region is garnished by great slabs of the celebrated footprint sandstones from the Connecticut valley, and a huge stump taken entire from a coal-bed. Iron staircases, clinging to

the wall in spiral flight, lead to the top story, and the court is roofed with glass. On the right and left of the entrance are doors leading to business offices, the blow-pipe laboratory, and the lecture-rooms of the Professors Dana (father and son), where large audiences frequently gather to hear the instruction designed for undergraduates alone; and in the rear of the court, on the ground-floor, is the exhibition hall for minerals, of which the museum possesses an almost unrivalled collection. This might be expected, considering the men—Dana, Silliman, Brush, and others—of whose labours it is the result.

The only thing in this room not locked up is a meteorite weighing 1600 lbs. The metal in one spot has been sawed off, and polished until it looks like burnished steel, and has been engraved with an historical inscription, from which it appears that this meteorite fell in Texas, presumably the only State in the Union large enough to receive it safely.

After the brilliant and many tinted ores, the endless



The Peabody Museum as it will appear when completed.

variety and beauty of the quartz crystals, and the substantial interest inspired by the metals, visitors always pause with new gratification before some curious rosetted crystals of a form of lime, though they usually quite overlook the "educational series," which has been spread with such pains for their instruction. This educational collection, which seems to be extremely apt and well selected, concentrates in a single case a practical glossary and text-book of mineralogy. To this epitome of the science all the rich and rare examples in the wall-cases are only attractive illustrations; and, the further to help the inquirer to understand them, several copies of Dana's "Mineralogy" will be found upon little tables near by. Here persons may sit and read, acquire and carry away the information, but not the *book*, for that is chained to an iron pillar.

The third floor is that most popular with the public, since it is devoted chiefly to modern animal life. The first thing to strike the eye in the south room is a fine series of comparative skeletons of primates, from civilised

man down to the humblest of monkeys, all hanging in a beautiful row by hooks screwed into the tops of their heads. Beyond them, the whole side of the room is filled with cases containing an orderly succession of skeletons illustrating all the vertebrate orders; while the centre of the room is occupied by the skeletons and stuffed hides of the larger mammals, like the camel, rhinoceros, a very dejected polar bear, &c.

In the same room several cases are filled with stuffed skins of mammals, birds, and reptiles. Beside most of the land birds are placed their nests, with the eggs; or else the eggs are glued upon upright tablets of ground glass, in which position they show to excellent advantage. One large case is devoted to a collection of New England birds alone, excellently mounted upon the branches of a tree. This is the work of Prof. W. D. Whitney, who, before he became prominent as a linguist, was known as a good ornithologist; as, in fact, he still is.

Passing to the west room on the same floor, one sees invertebrate preparations most attractively displayed.

They are confined almost wholly, however, to the crustacea, mollusks, radiates, and marine protozoa. Of insects there is a very small showing—only enough to represent scantily the classification of that immense class. This is partly because it is unwise to display insects freely, since exposure to the light causes their colours to fade, but is due chiefly to lack of material, owing to the fact that no entomologists of note have been especially interested in the progress of this museum.

On the other hand, the special tastes of Profs. Verrill, S. I. Smith, J. H. Emerton, and others, and the intimate relations the Museum (through these gentlemen) have sustained with the Smithsonian Institution and the U.S. Fish Commission, have brought the department of marine invertebrates to an almost unrivalled perfection. In no room does the casual visitor linger longer than in this one; while its contents are unusually interesting to specialists, because of the large proportion of type-specimens included. In many instances these are unique; as, for example, some of those beautiful orange and scarlet gorgonias or "sea-fans"—flat, branchless, mossy growths of calcareous matter, which resemble great masses of pressed seaweed. One case is wholly filled with these corallines; and it is doubtful whether any museum in the world can make a better showing of them.

The corals, also, are very fine, embracing many rare and even unique forms, as might be expected, remembering Prof. J. D. Dana's labours in that direction; so that only the Museum of Comparative Zoology equals this part of the cabinet.

In the way of deep-sea forms of crustaceans, and echinoderms also, a great number of novel species are publicly displayed, which were procured in recent dredgings by the Fish Commission. Among them stand large jars holding alcoholic remains of the giant cuttle-fishes upon which Verrill has written so many learned pages; and overhead hang Emerton's paper models of *Architeuthis* and a huge octopus, which half the visitors take to be real devil-fishes stuffed, and gaze at with fearful curiosity.

The remaining rooms on this floor are occupied as laboratories or lecture-rooms by Profs. Verrill and Smith, of the Sheffield Scientific School.

The fourth story contains storerooms filled with fossils, a collection (on exhibition) of about two thousand antiquities of great value from Central America, and a fair show of archaeological relics, the most notable part of which is the pottery from the mounds of the Ohio valley.

But the glory of the Yale Museum is its palæontological treasures, brought together wholly by Prof. O. C. Marsh. The few representatives of this collection visible in the second-floor rooms and in the hall-ways are alone sufficient to stamp the museum as pre-eminent in this line; but they are merely an advertisement of what cellar and attic contain. It is not too much to say that, in respect to vertebrate palæontology (outside of fishes), this museum is not surpassed in the world. Where other collections own fragments or single skeletons, Prof. Marsh boasts scores or hundreds of individuals, while many extinct races are known only by their fossil remains in his possession.

This is the result of wisely-directed energy, and the ability to spend money promptly and liberally. Marsh's frequent expeditions to the far west are well known to geologists. Many car-loads resulting from these were not only shipped home by himself, but his agents have been forwarding enormous quantities ever since from Wyoming and Colorado "quarries."

To Prof. Marsh's personal collection somewhat has been added at the museum by the U. S. Geological Survey, which will become the publisher of the outcome of his studies now in progress. A score or so of assistants are constantly on duty, either in study, or in the mechanical work of skilfully extracting fossils from the rocky matrix; in match-

ing and mounting, by the aid of wire, clay, and plaster, for permanent preservation, the often badly-broken bones of some antique brute whose extinction most of the world can accept with resignation; or in making casts, models, and drawings of fossils, original and "restored."

Several quarto volumes are already under weigh, and scarcely an issue of the *American Journal of Science* appears without an advance note of some special discovery in vertebrate palæontology, anticipating the completer descriptions to be made from this museum's rich materials.

#### NOTES

THE new Lord Rector of Glasgow University, Dr. Lushington, was installed on the 26th ult. The address, which was in every way worthy both of the University and of the Lord Rector, contrasted strongly, with its calm, deep utterances and its grasp of the needs of a complete academic life, with the more or less political utterances to which we have been too much accustomed on similar occasions. We give the following quotation touching scientific work at a University:—"Communion of mind with mind is the most powerful help to mental growth, calling forth and expanding the intellectual powers which it is the duty of every free man to cultivate; in such intercourse he who gives receives, and is made richer in giving what awakens new life in another. By fellowship of this kind toil is sweetened and obstacles overcome. What is the history of the greatest inventors and discoverers the world has seen, but a firm defiance of difficulties and discouragements? And who that ever honestly faced any difficult problem, and 'oft foiled, oft rose' in the struggle has failed to gain at last the meed of hard-won victory? The rapture of Balboa, when from a peak of Darien he first gazed on the Pacific, is even less touching than that austere joy, of contemplation destined to those who by steadfast and painful efforts, long seemingly unrewarded, have wrested from nature some hitherto unguessed secret, some truth which illumines and brings into closer union other familiar but as yet unconnected aspects of knowledge. When, after years of doubtful poring, the light flashed upon Newton which was for ever to make clear to man the dynamics of the heavenly bodies, showing how the same law sways every leaf that flutters in the gale and the remotest star-clusters, we can well conceive how the ecstasy of wonder and delight was a disturbing presence that overpowered him, and made him request a friend to finish the calculation he had begun. And every generation, every decade, almost every year, opens new vistas through which the piercing eye, armed with weapons inherited from earlier conquests, may look forward bright in the hope of adding something more to the store of accomplished good to mankind; for in knowledge, as in nature, nothing is unfruitful. Such hope cheered and upheld many daring pioneers of science, whose venerated names, now become household words, are linked together for ever in the history of human progress, known and honoured throughout the whole civilised world. Yet who in the age of Watt, even in the boldest flights of presaging imagination, could have foretold such wondrous conquests over space and time as the spectro-scope, the electric telegraph, and the telephone have revealed? But I forbear from dwelling longer on the incentives to exertion held out to all by the numerous physical sciences which have so many gifted exponents, before whom it becomes a non-expert to be rather a listener than a speaker. May all honour and success be theirs in sounding the mysterious depths of nature, and drawing into light the essential order which underlies her seeming complexities, ruling them with the necessity of intelligible relations. Many and various are the marvels with which "the world of eye and ear" surrounds us, inviting adventurous search into their far recesses; but as human thought advances, winning ever wider triumphs in solving riddle after riddle, must not the further