

facturing establishments are themselves conducting independent laboratories of research, and there is an increasing demand for men who have not only the training of the technical school, but the attitude of mind to attack new problems; men who have not simply a basis of theoretical and practical knowledge to begin research, but who have the spirit of research as well.

This demand for research in engineering and for men capable of undertaking such work has long been recognized, and the Institute has for some years looked toward the inauguration of a department of engineering research. The installation this year of the Lowell Electrical Engineering laboratories, with the additional facilities which are thus offered, makes the present an opportune time to undertake this work. A graduate school of research will therefore be established as a distinct department of the Institute immediately after the opening of the next academic year—namely, on October 7, 1903—under conditions which are given in the announcement that will be issued.

An examination of these conditions will make it clear that the intention of the authorities of the Massachusetts Institute of Technology is to provide in the Graduate School of Engineering Research facilities for a small number of advanced students who show capacity for research.

The administration of the School is vested by the corporation and faculty in a council of members of the faculty, including the president as chairman.

The staff will consist of professors and instructors of the Institute and other persons actually engaged in engineering enterprises.

Opportunities for advanced study and research will be provided in the following branches of engineering:

Civil Engineering.
Sanitary Engineering.

Mechanical Engineering.

Electrical Engineering.

Naval Architecture and Marine Engineering.

Mining Engineering and Metallurgy.

Chemical Engineering and Industrial Chemistry.

In these subjects the degree of Doctor of Engineering (Eng. Dr.) will be awarded. As heretofore, the Institute will offer courses of advanced study and research in pure science—*e. g.*, mathematics, mechanics, physics, chemistry, biology and geology—leading to the degree of Doctor of Philosophy (Ph.D.). These advanced courses will be open also to students of engineering research.

SCIENTIFIC BOOKS.

DR. MEYER ON SOME EUROPEAN MUSEUMS.

PENDING the publication of the final part of his memoir on the museums of the eastern United States, Dr. A. B. Meyer has given us the results of his observations on some of the museums and other educational institutions of Great Britain and eastern Europe. These were visited in order to make comparisons between them and similar institutions in America, and to gather all possible information regarding museum buildings and installation. The present paper deals especially with the three great problems of light, heat and ventilation which confront the architect of every large museum, although the reader will find information on all points of interest. The complaint is made that many desired illustrations were not to be had, and it has been suggested that the present demand for the illustrated postal card has much to do with the lack of good-sized photographs of many important buildings.

In regard to lighting Dr. Meyer is emphatically of the opinion that the proper method is by side windows and preferably by windows on both sides of exhibition halls, in order to check the reflection from the glass of cases standing in shadow. The most customary method of lighting is by overhead skylights, in order to gain wall space, but while this is well enough for a single floor, when one or two galleries are introduced it

naturally results in poor illumination beneath portions of these, and the only way to do away with such dark corners is by side windows. The defects of overhead light are shown in the Edinburgh Museum of Science and Art, and in the Museum of the Royal College of Surgeons, London, although the same system is retained in a recent addition in order to preserve uniformity of architecture.

The problems of ventilation and heating are considered in various places and the palm awarded to the Glasgow Museum and the Free Public Museum of Liverpool, which, Dr. Meyer emphatically declares, 'excel all other museums in the world in respect to the method of heating and ventilating.' Curiously enough, while these two institutions were under construction practically at the same time, neither was aware that the same system of ventilation had been adopted by the other. In these two museums the air is drawn in through a large air shaft, six by nine feet, filtered, warmed and forced into the buildings by large blowers. The windows are permanently closed and the pressure of air within kept at a higher point than that of the outside air, so that dust is not sucked in through doors or other unavoidable openings. In some other museums the windows are kept closed and the air more or less cleansed as it is drawn into the buildings, but none of the devices adopted is so efficient as that employed at Glasgow and Liverpool, known as 'Keys improved Plenum method.'

Dr. Meyer frequently calls attention to the fact that too often the exterior of a museum is designed without reference to the interior, when the proper method to be followed is quite the reverse of this, and that the arrangement of the exhibition halls and offices should be decided first and the exterior adapted to them. In regard to these same exteriors the illustrations show a great diversity of style and various attempts to combine architectural effect with room and light. One of the least successful of these architecturally seems to be the new museum at Brussels, although this may perhaps be compensated for by the abundance of light in the exhibition halls,

while the most successful, judging by the illustrations, is the Liverpool Free Museum. This, however, is probably because there is no view of the new Galleries of Comparative Anatomy and Anthropology at Paris, whose architectural features and harmonious methods of installation elicit the warmest praise, with the exception of the fern leaf decoration of the balcony rails. These are said to be over-ornamented to such an extent as to be obtrusive, a feature that will perhaps be toned down by age.

The pure Gothic style so often adopted results in gloomy interiors, but the author calls attention to the fact that the modified gothic, such as is used in the University of Chicago, may be successfully employed. In connection with the subject of architecture something might well have been said of museum cases, for architects are responsible for many failures in this direction, and few of them are competent to plan even a moderately good case.

Dr. Meyer is evidently of the opinion that most museums are too freely open to visitors, objects on exhibition being ruined by long exposure to light, although the Paris museums of natural history go the other extreme and are open for so short a time that it is difficult to properly examine the collections. Here he touches upon a difficult problem in administration and one which is particularly so in the United States, where the tendency is to extend, rather than curtail the hours of exhibition. In many ways it seems best to submit to the inevitable, and, after taking every possible precaution to so admit the light that it may be diffused, admit the public as freely as possible. The rarer objects might be withheld from exhibition or displayed only on certain days or hours, while the more common objects could be replaced. Few, if any, museums now place their types of birds or mammals on exhibition, and the question of showing large mammals and rare birds is becoming serious in view of the destruction now going on.

Another point incidentally touched on in this paper is what may be termed the over-exhibition of specimens, the display of so

large a number that the visitor is simply bewildered and but little interested or instructed. And this point is well made, for there is not the slightest doubt that a limited number of specimens, well installed and properly labeled, is in every way better than the large series so often shown. The arrangement of natural history collections on a geographical basis is also dwelt on in various places, and this has always seemed to the present writer the best method by far. The prediction is here ventured that the successful museum of the future will, so far as the exhibition of biological material is concerned, consist of a central synoptic or index collection, supplemented by series displaying the geographical and geological distribution of plants and animals, and various features in their life histories. This by no means precludes the display of systematic series wherever this may be thought desirable, but this feature of museums is commonly made far too much of. The exhibition series of a museum is for the public, and the average visitor does not go to the museum for study, and the advanced student does not, as a rule, seek for information in the material on exhibition, although there are notable exceptions to this rule in anthropological collections.

In the department of anthropology, by the way, Dr. Meyer does not favor a geographical arrangement, but advocates bringing together all objects of a kind in order that their development and variation may be seen. Where space and material admit, however, he considers that there should also be geographical series to illustrate the customs of different races. In respect to installation, the Pitt-Rivers Museum at Oxford is awarded the first place among English ethnological museums and the scheme of its arrangement is given in full.

A detail of installation, shown in many of the illustrations, is the large number of skeletons on exhibition with no protection whatever from dust or visitors, and one can but think that either the attendants are more vigilant abroad than here or the visitors more conscientious. Specimens so recklessly displayed in this country would run great chance

of being ruined by dust, or of being broken by relic-seeking visitors; no specimen that can possibly be put in a case should be exposed.

Some of the shortcomings of museums are, however, unavoidable, while others, as Dr. Meyer is careful to say in his introductory remarks are 'to a greater extent the fault of the establishment than of the persons in charge, for one individual has little control of the many circumstances on which the historical development of museums and other institutions depends.' It is to be hoped that Dr. Meyer may soon be able to embody his views regarding museums in the construction of a new museum in Dresden, but we trust he will not wait until that time to give us a summary of these views, and possibly he may present them in his next paper.

F. A. L.

SCIENTIFIC JOURNALS AND ARTICLES.

In *The American Naturalist* for November Bashford Dean presents the 'Biometric Evidence in the Problem of the Paired Limbs of the Vertebrates,' concluding that it is in favor of the fold theory and against the hypothesis that the limbs are modified gill arches. C. R. Eastman gives a 'Notice of Interesting Forms of Carboniferous Fish Remains,' and Lætitia M. Snow considers 'The Microcosm of the Drift Line,' being a discussion of the life relations of the insects found along the shores of Lake Michigan. Joseph A. Cushman gives 'Studies of Localized Stages of Growth in Some Common New England Plants' and H. S. Pratt under 'Synopses of North American Invertebrates,' continues the treatment of the Trematodes, the first part of which appeared in the *Naturalist* for August, 1900. The number contains the 'Quarterly Record of Gifts, Appointments and Deaths.'

The Popular Science Monthly for December opens with an article by David Starr Jordan on 'The Higher Education of Women,' which concludes with the statement that co-education is never a question where it has been tried. W. P. Pycraft tells of 'The Significance of the Condition of Young Birds