

teachers for high schools, whenever the bachelor's course is regarded as the maximum obtainable preparation. The college student who desires to become a specialist in school hygiene or a public sanitarian may omit the regular medical course and proceed from the bachelor's degree to the doctor of philosophy in hygiene or to the new degree of doctor of public health. In order to open this field to college men and women, candidates for the bachelor of arts in education should be permitted to follow hygiene as a major subject, extending through at least three years and properly correlated with other sciences, cultural and professional courses. In the courses, hygiene, preventive medicine, physiology and psychiatry, the medical department may be utilized. The following typical plan for grouping of studies for prospective teachers in college makes possible the choice of such a major subject and at the same time affords in the four years following the high school: (1) a basis of general culture in the languages, mathematics, sciences and history; (2) the essentials of pedagogy; (3) opportunity for increasing specialization under the direction of competent advisers.

Freshman	Sophomore	Junior	Senior
Eng. 3 hrs.	Eng. 3 hrs.	Gen. & Ed. Phy. 5 hrs.	Hist. & Prin. of Education 5 hrs.
Lang. 3 hrs.	Lang. 3 hrs.	Educational Hygiene 3 hrs.	El. or Secondary Education 3 hrs.
Math. or Hist. 3 hrs. Phys. or Chem. 5 hrs.	Math. or Hist. 3 hrs. Biology (Physiology) 5 hrs.	Elective 9 hrs.	Elective 9 hrs.
Elective 3 hrs.	Elective 3 hrs.		
Total 17 hrs. per week.	17 hrs.	17 hrs.	17 hrs.

The electives (major and related subjects) courses should be chosen under care-

ful guidance and with proper restrictions.

4. In the study of the school problems of elimination, retardation, repeating and of the exceptional child, the department of education should lead. The educational laboratory, and psychological clinic, an adjunct to the laboratory of psychology, is the point for concentration of effort upon these problems, by cooperation of psychologist, physician, sociologist and teacher. The demonstrated value of the modern psychological clinic must be rescued and preserved from the errors and excesses of incapable men and women, whether in medicine or in education.

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#### *THE EDUCATIONAL WORK OF A GREAT MUSEUM<sup>1</sup>*

THE educational work of a museum should be governed entirely by the purposes for which the museum is established. The very greatest museums may give pleasure to the public, may educate the more intelligent groups of people, among which are college graduates, may educate such classes as teachers and children, and should not neglect the education of the masses. One of the most important services to education which a great museum can accomplish is to carry on surveys, explorations and original investigation, and it is only from such work that any facts are learned which may in turn be given out to mankind by means of exhibits, popular guide-books, scientific reports, lectures and contributions to encyclopedias, textbooks, popular magazines and newspaper accounts. Great care should be taken that research work is never neglected in the stampede for "popularization." Such great museums may also have departments for special

<sup>1</sup> An abstract of an illustrated lecture delivered, in anticipation of the opening of the Victoria Memorial Museum, the national museum of Canada, at the inauguration in Ottawa of free lectures to the people under school board control, November 10, 1911.

classes of the people, as for instance blind people and kindergarten children.

Special museums must serve the specialty for which they are founded, and small museums also have to confine their work to a narrower scope of educational endeavor. Provincial museums seldom have sufficient funds to make world-wide investigations or teach all subjects, and it is perhaps best for such a museum to devote itself solely to its own province or certain subjects. The same is also true of a county, and in some cases a city, museum. The university museum should serve the purposes of the university, its students and professors, that is, supply illustrative material for classes, provide for the research necessary to keep professors up to date, and allow advanced students actual research experience. In common honesty its funds should not be used primarily for the general public or for subjects outside the line of the university's work. An art museum must confine itself to esthetics or other branches of art endeavor. A commercial museum of course should keep its attention on work of a commercial nature. It is evident that there are many methods of museum administration, each of them good in its own place and each of them bad or even dishonest when out of place.

A museum building should be constructed so that additions may be made to it without ruining its architecture or causing unnecessary expense for remodeling or making connections. Such a building should be built with a view to its purpose so that the laboratories, offices, exhibition halls and the like may be properly lighted and each suitable for its special kind of work. In the past museums have usually been built to please an architect and the result is that most museum buildings are abominably adapted to the use of the museum and its staff. The day must soon come when museum buildings will be constructed with a view to the purpose for which they are to be used and then the result of museum work will be even more worth while than at present.

No matter what the scientific investigator and the teacher may say, one of the justifiable purposes of a museum is to give recreation and happiness to great masses of the people and by far the greater number of visitors to the large museums drop in casually for just these purposes. Very few of them come to be educated or to carry on research, but from the casual visits many people carry away a desire to investigate and still more to receive educational benefits.

The educational section of a museum may be likened to extra illustrated text-books. For instance in text-books on birds, we may have pictures of birds, even colored pictures, but in a museum we have the actual birds, their skeletons, their organs, their nests and their eggs. Thus a large collection of birds in a good educational museum is like a great text-book on birds illustrated by these things, while the labels take the place of the printed matter in the text-book. Educational popularization should never be carried to the extreme of exaggeration and untruthfulness affected by certain schools of museum employees.

A museum may also serve as a great warehouse where are kept such valuable things as individuals should not hoard in their homes. For instance an object from which something may be learned, and which is the only object of its kind in the world, should not be kept in a home where it may be destroyed by fire, but in a fireproof museum; nor ought it to be where its owner and his friends are the only ones able to see it, but it should be available for all who may desire benefit from it, whether they be citizens of the province or nation owning the museum, or visitors from the most distant lands. No museum should be a collection of merely curious things.

Sometimes animals, plants and the like are exhibited surrounded by representations of their natural home and in front of a painting representing the country in which they occur. Such exhibits depend for their excellence on the skill of the scientist who plans them, the collector who secures the material and artists and mechanics of various kinds. Each of

these does a particular share of the work which he is perhaps the only man able to do. The artist may be brought thousands of miles because of his ability to paint just the right kind of background. The museum expert is skillful in writing labels which may be understood not only by the scientist, who often knows all the facts without any label, but also by the people who do not know the facts and consequently need information. Such a man should write the label.

In a great research museum there are always thousands of specimens in the store-rooms and laboratories kept for study and research; that is, they are used for the increase of human knowledge. To expose them to the light and dust of exhibition might destroy them while duplicate specimens, pictures, casts and models may serve equally well or even better for educating the public.

All great museums have brains, in other words they have a staff of experts who perhaps are not seen in the exhibition halls, but who find out the new knowledge which the people are always anxious to have, who plan the work, write the labels and guide-books, give the lectures, direct the field explorations and so keep the museum from ever being dead and dusty. One of the great museum men of the world once said that a finished museum was a dead museum, and this well expresses the idea that there is no such thing as a finished museum, for scientists are always making new discoveries which lead them to add new exhibits and rearrange old ones. There is always a great deal of work going on in the workshops, of which the visitors to the exhibition halls have little idea. This work can not be done by untrained men, but must be accomplished by artisans, mechanics and artists who have had very special training each in his own particular line. Sometimes in a country of millions of inhabitants there is no man trained in a certain special kind of work so that a museum often has to send across the sea or to some equally far-away place for a skilled mechanic. Even Japanese, Eskimos and Indians are employed in one of our largest

museums. Many days' and sometimes months' work must be done—not by one man but by seven or eight men, each doing his own kind of work in the most expert way—to produce an exhibit from which the public may learn in a few moments what has taken all this time to produce. Then too one must not forget that to get some material by means of which new knowledge is found out, and by means of which this knowledge is diffused to all the world, hardy men must penetrate into the uttermost wilds of the earth, endure the bitter cold of the Arctic and the dangers of the tropical forest.

Some museums have many friends, for instance for years the Barnum and Bailey circus had all of its rare animals which died on the road embalmed or otherwise preserved and sent to one of the museums in New York City. Then, too, wealthy men vie with each other in giving funds for expeditions, research, scientific books, exhibits, teaching labels and guide-books, and for lecture courses in connection with these museums. Sometimes they endow a branch of museum work or an entire museum. Some men have each given more than a million dollars for such purposes and this is one of the indications of the value of a museum, for men capable of amassing millions do not endow institutions which they consider valueless.

Sometimes models teach quite as much as actual specimens. A model of a mosquito made many times larger than the insect itself shows us how to cope with malarial fever and yellow fever. We could not see the means by which the mosquito transmitted these diseases by looking at the mosquito herself, but the scientist in his laboratory with his microscope may find out all these things, make accurate plans and drawings of the various parts of the insect, and leave it to skilled mechanics to spend many months in reproducing them accurately on a large scale. Such work is not an extravagance when we consider that if the doctors and the people learn to avoid yellow fever and malaria the life insurance companies do not have to pay so much life in-

surance and the amount paid for one death is easily sufficient for the construction of such a model.

Pictures are very useful in connection with museum exhibits. Sometimes photographs are used, again sketches or paintings or transparencies, and frequently lantern slides are employed. These pictures may show the sort of country from which the objects come, or they may be reconstructions based on careful study. For instance, bones of extinct animals are frequently found. No one knows what these animals looked like in life, but the scientist can study the bones and compare them with the bones of animals which he is able to observe. He can have his artist paint these living animals and can explain to him in what respect the bones of the extinct animal differ. By a study of the bones of the feet he may learn and explain to the artist whether the animal walked in a swamp or on rocky ground. By a study of the animal's teeth he may tell what kind of food it ate. Then the artist can make his picture very much more intelligently than otherwise would be the case and this picture conveys to the people some idea of what the animal formerly looked like. Sometimes the artist makes a sculpture of the animal instead of a painting or to accompany the painting so that a complete exhibit might show a skeleton with a painting, a model, a label, a map, and perhaps even another animal such as lives to-day and is akin to the extinct animal.

A map may show the part of the world from which a specimen comes, other maps may show the details of its home country, and maps may be used to show its distribution over the earth and the relation of this region to some other area, as for instance one where certain plants grow. Maps may be mere outlines or shaded, or they may be relief models made to resemble a surface of the country.

Specimens may be arranged in series, and in this way teach much more than they would singly. One may arrange together specimens which illustrate the idea of evolution or which show all the different musical instruments of

the world. One may show together all the things found in a certain province or all the animals, plants, minerals and so forth, of a certain region, as for instance a desert, and contrast them with things from a forest.

Different classes of people use museums. Carpenters and cabinet makers often study the collections of woods, miners the collections of minerals, teachers of art and architecture the collections of primitive art and the objects and pictures showing the types of buildings of other times and other peoples.

Some collections are of great value, as for instance the display of gems exhibited by Tiffany and Company at the Paris Exposition. Such a collection is sometimes protected by iron gratings on the windows, and armed guards night and day. Then too there may be electrical connection with the police department so that an alarm may be given either by the guard or when a case is broken open.

Exhibits showing mankind occasionally include plaster casts of living people. Placed on these casts are their clothing, the whole being arranged so that it will illustrate their occupations and their relations to the country in which they live as well as its products, both plant and animal.

Frequently pictures or casts or models must be used where the original specimens are too expensive or too large and heavy to be brought to the museum or even too large to be given space in a museum. Then, too, casts may be used for such things as can not be removed from countries which have silly laws preventing their exportation.

The expeditions of a great museum often cover practically the whole world. The American Museum of Natural History in New York in one year had expeditions in many parts of North America, in South America, Asia and the South Sea Islands.

The specimens too valuable for study to be put on exhibition, duplicate collections which are used for study and the specimens for which there is no room in the exhibition halls are kept in rooms for study where they are safe from changes of climate, insect pests,

dust and careless handling. Some of these collections which are never seen by the public, unless they ask to visit the storage rooms, are vast in extent. In a great museum they may be of more value and consist of a larger number of specimens than is found in all the museums put together in a region as large as Canada and the states west of the Mississippi. These collections are of course placed as close together as it is possible to have them and yet be able to get at them for research and for use in illustrating truths to visitors.

When an expedition goes out from a great museum and learns something new, the facts are published in reports which are oftentimes illustrated. This is partly because a single manuscript giving the facts might be burned or lost. These reports are then sent to perhaps a hundred different libraries widely scattered so that they may be available as nearly as possible to all the people of the world. That is, they should be found in such places as London, St. Petersburg, Tokio and Melbourne. It is from such reports that the writers of encyclopedias, text-books and magazine articles secure the knowledge which is finally the common property of all.

A great educational museum always has a library from which its publications are sent out and in which anybody may read works on the subjects covered by the museum. One of the great uses for the museum library is that the staff may always inform itself, for it would not be economical to send an expedition to gather facts about a place if all those facts could be read from books.

After the return of an expedition and after its reports have been published the specimens are put on exhibition together with labels, such a report, popular guide-books, maps, photographs and pictures. Sometimes the results are illustrated by models. Lectures are given to scientific colleagues, to highly educated people, to children, and to the general public, each lecture being made as far as possible appropriate to the audience. The reports contain all the facts, many of which are uninteresting to the public to-day but which would be lost unless published and which may some

day be of such great value that they deserve to be saved. These reports are sometimes placed with the exhibits for the use of those who wish to read them, but more often extracts of the more useful and interesting parts are made and published as guide-books for all the people. In some museums such guide-books are given to the public, but as certain classes of people throw them away or destroy them, other museums prefer to charge a small sum for guides. This charge may be less than the cost of the book.

A few museums allow space for special and temporary exhibits and in this way become a sort of headquarters for all kinds of educational expositions such as flower shows, and exhibits illustrating the advance in the fight against the great white plague, expositions of modern sanitary methods and horticultural exhibits. Then too some of the great museums serve as centers for scientific and educational meetings, the large lecture hall being particularly appropriate for general meetings, and the smaller rooms for special societies.

The photographs taken on expeditions are kept in files or in scrapbooks where they may be consulted and copies are given out in small numbers free of cost or in large quantities for the actual cost of the photographs without regard to the expense of the expedition necessary to secure them. These are given to scientists for study and for illustrating their books. They are given to educators to use as illustrations and to hold up before their classes. Many of them are used by magazine writers and newspaper men for illustrations and by sculptors and painters. In this way the explorer brings back glimpses of far-away lands which eventually are shared with people unable to travel or who must travel nearer home.

Vast collections of lantern slides are also maintained in some of the great museums. These are used to illustrate scientific, educational, or entertaining lectures both in the museum and elsewhere. Moving pictures are also occasionally used.

A large lecture hall seating over one thousand people is a useful feature of some of the

great museums which also have as a rule several smaller lecture halls. As many as seven or eight lectures may be held in such a museum in one week, as for instance one for the scientist, three in the afternoons for school children, two in the evenings for the general public, and other lectures for certain special classes of people, as for instance those interested in breeding or sanitation.

All the educational work of the museum exhibits is not confined to the inside of a great museum. Special cases of specimens are prepared and sent out to schools, libraries and other suitable places. Sometimes these are loaned indefinitely but very often they are loaned for a week and then moved to another place. In New York this feature of the work became so extensive that an automobile was purchased to transport the collections from the museum to the schools and from school to school, so that thousands of children were reached. This sort of work is somewhat akin to the work of branch banks and traveling libraries.

Many of our people do not appreciate the real use of a museum and we do not wonder at it when we see the dusty, poorly arranged collections in many museums where there are few, if any, labels and the whole tends to disgust, in fact to teach disorder rather than to be pleasing, helpful or educative, but in an up-to-date museum every day you may see classes from kindergartens enthusiastically examining specimens under the guidance of a museum kindergartner. Frequently one may see classes of bright high-school or college students on a visit to the museum halls, supplementing their educational work by viewing the actual things of which they study. They may be guided by a curator. Thousands of slum children in the greater cities are cheered, educated and uplifted by being taken to the museums by their teachers. One time when a lecture was advertised for school children by an enterprising newspaper which offered a prize for the best essay on a certain subject, over seven thousand children endeavored to attend the lecture held in a hall seating only

one thousand four hundred, but one of the museum authorities sprang to his telephone and in as many minutes had twelve of the staff taking as many groups of the children to various parts of the building where they were entertained and instructed.

A great educational museum is usually open free to the public every day in the year so that people engaged on certain days may have the greatest possible opportunity to visit it for recreation, education or research. On the occasion of an exhibit for the prevention and cure of tuberculosis, in one museum over forty thousand visitors passed between the police lines in and out of the exhibit in a single day, which proved conclusively that the public is thoroughly alive to the importance and value of the most modern and useful museum work.

HARLAN I. SMITH

GEOLOGICAL SURVEY OF CANADA

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*THE PROFESSIONAL WORK OF  
PROFESSOR MORRIS LOEB<sup>1</sup>*

MORRIS LOEB was a man in speaking of whom I wish I might have had time to choose my words with more deliberation. His nature showed itself always in such a refinement as to command its tracing only with the most delicate touch. Tender is the wound in losing a friend in science whom I had known for nearly twenty years,—in fact, since the time he was the secretary of the Section of Chemistry of the American Association at the Brooklyn meeting. At that time he was participating in the great task of habilitating the American Chemical Society, with the history of which no doubt all here are familiar.

I wish I were able to fittingly tell you of the spirit actuating him at that time, as it proved an inspiration to me then, and afterwards served to cement a friendship into a closer personal relationship.

Born and reared in wealth, a great plan in the business world ready for his acceptance, while gaining a broad culture at Harvard, he inhaled the breath of Wolcott Gibbs's scien-

<sup>1</sup> Presented at the October meeting of the New York Section of the American Chemical Society.