

## PUBLIC MUSEUMS.

### Lecture by Professor Louis Agassiz.

Prof. Louis Agassiz delivered a lecture last evening before the Mercantile Library Association, upon the subject of "Public Museums." Being possessed to the large audience by the President of the Association, he spoke as follows:

Ladies and Gentlemen,—I think I cannot more fitly introduce the subject of this evening's lecture, than by a comparison with those collections with which you are so familiar,—books and libraries. For museums are libraries of the works of nature, just as libraries are museums of the written works of man. But there are as different kinds of libraries as there are different kinds of museums. We take, first, of the miscellaneous libraries, brought together chiefly by arrangement, and in which not much regard is held to a methodical instruction. We have, next, libraries of literary societies, collected with special reference to the subject for which such societies are formed. It may be historical libraries; it may be libraries of natural history; it may be libraries of literature, extending over certain parts of the subject. Such libraries already aim at a more general and a more methodical information to those who use such books. Then we have general libraries, embracing everything, if possible, that has been written on any subject; and, of course, so large collections of books require a special arrangement, that they may be rendered more useful and easily available. Were such libraries, containing hundreds of thousands of volumes, only arranged according to the size of the books, you are at once on the same footing as the man who would come upon the most diversified subjects,—benefiting him who would select that which he is particularly in want of. But then, if such a general arrangement as size would secure cannot be pursued, in a large library, the question is, at what, and in what order shall be arranged? Shall the books be arranged according to the languages in which they are written, so that different nationalities shall be represented singly? Or shall the books be arranged according to the subjects of which they treat, so that the scientific books be brought together, and all those relating to special branches of science shall be arranged side by side, and those treating of history, of astronomy, of mathematics, kept together? That would be another way of arranging a very extensive library. Or it might be arranged according to the periods in which the books were written, so that we should have the works of each age together; and this might have its advantages. And, in reality, we find that various libraries are arranged in various ways. They may be arranged according to the alphabetical order of the authors' names; and in order to make the different purposes for which a library may serve as available as possible, analogues are arranged, in which these different objects are combined and brought so together that in any way in which a library is needed it may become accessible by reference to catalogues. Now, we have museums of different kinds, corresponding to these three classes of libraries. We have miscellaneous museums, museums of variety, intended for amusement and for light instruction; and I know no better example of this kind than that which adorns this city; for it includes what so many others have admitted,—exposures, menageries, and all sorts of inventions, pandering more to a sense of the ludicrous and the extravagant, than to that of real instruction. Then we have museums of scientific societies. And in this city, again, we have one which deserves fully the support of all those who have the progress of science at heart; for it is not only one of the best in the country, but the members of that association have, at all times, communicated extensively to the real progress of natural history. To them we are indebted for that series of handsome contributions to science, published under the title of "Journals and Proceedings of the Boston Natural History Society." It is from among their members, that when the State decided to have a geological and natural history survey of the State, were selected the men who prepared these reports. And let me say, that never was, on this continent, a work done more efficiently and more to the purpose; for it has served as a model in all those surveys instituted by other States throughout the country, and even the surveys which were directed by the general government, which have resulted in an amount of information gathered from all parts of the country which has changed the state of our knowledge of America, as far as its natural productions are concerned, entirely. I wish to spend this evening, particularly of the educational importance of museums,—of public museums,—and especially of that which is now founding and organizing, at Cambridge; and I should have felt that I was untrue to my calling if I had not alluded to the claims of the Boston Natural History Society, to a share of support to that which is so largely and liberally given by the community to the Museum at Cambridge; and I wish to say, at the same time, that those institutions are no more rivals than general libraries are rivals of the special libraries of literary societies. One is the complement of the other; one assists the other, and the prosperity of one is the prosperity of the other; and it is in that friendly feeling that I wish to have the Museum at Cambridge and that in Boston regarded. And I should be pleased also to say a word of the Aquarium in Boston, for it is a most useful and instructive establishment,—one where I never go without learning something, and something worth learning. For there is an opportunity there of seeing, especially, aquatic animals in their natural elements, which, in the broad ocean, we have no opportunity of examining. When a fish is brought up at the end of a line or in a net, it is in convulsions; and we never see its natural demeanor, in its element, before we had a chance to behold it peacefully playing between two transparent plates of glass.

Now, how shall a museum be arranged? When we find it already so difficult to arrange a library, and satisfy the purpose for which its volumes are brought together, it is still more difficult to devise a proper arrangement for a museum. For books themselves help us in their arrangement. They have a title; they tell us, as soon as we open the first page, what they are about; and according to the title, we know how to place them, and where to place them, provided we have some idea in our minds as to what purpose we want to attain by the arrangement. And when we bring together the works of Nature, and when we seek to arrange them in the most useful manner, what do these things tell us about their arrangement? By what shall we be guided in order to prepare the most useful and the most instructive arrangement? After many and protracted hesitations, after attempts of all kinds, in the beginning of this century, a method was arranged to which I will especially allude, leaving out of sight the vegetable and mineral kingdoms. A method was proposed by Cuvier for the classification of the animal kingdom, based chiefly upon their structure. That is now the best we know; and it is according to our insight into the internal organization of animals, that our museums are arranged. And you will at once see how easy this becomes as soon as we have the necessary knowledge for that purpose. We are impressed, at first sight with the great resemblance which exists between all birds. There is no one who can overlook the fact that these animals are alike in many features. They have two wings, two legs, they are covered with scales; they have bills;—all parts in their external features, which show us that, in a natural arrangement, they should go together. And similar diversified beings, resembling one another so closely, constitute what naturalists have called a class. We find that all the members of the animal kingdom are closely related to one another as birds do. When we attempt to classify the higher animals, such as quadrupeds, we find it easy to bring together wolves and dogs and tigers, which are carnivorous animals, and to place by their side cats, lions, tigers, and hyenas, and the like because they have similar habits. They have even certain external resemblances. We would not hesitate to class with them our cattle, and the deer, and many other animals, because they are covered with fur. But when we come to the bats we find some difficulty. They have some peculiarities that do not belong to other four-clawed mammals. Then it would seem that bats should go among the birds. They lay eggs, but being sooth they are in the same manner as do the other mammals. Here we are perplexed to know how to arrange such a group of animals, until we penetrate deeper, and we make their internal structure. We then find that bats have all the general characteristics of the other animals covered with fur, and we no longer hesitate to assign them a place among quadrupeds. But when we come to the whale, somebody calls them a fish. And so they were placed among fishes for a long time, though it is ascertained that they produce living offspring, have warm blood, and breathe from lungs, not from gills. But it is demonstrated that the internal organization has more to say about the real affinity of animals, than any external appearance. For studies, in their outline, resemble fishes more than even their nearest relatives, the quadrupeds. And so we may go on to compare the relations which we easily appreciate, and penetrate further and further into those relations which are less perceptible; until we find that only a certain number of difficulties are left, towards which attention may be turned, until they are solved, and a general classification based upon sound principles is in the end obtained. Such was that which Cuvier, at the beginning of this century, founded, when he divided the whole animal kingdom into four great divisions, according to the plan of their structure. And here let me, in a few words, point out these divisions, so that you may understand some few general features which I desire to present to your attention. I take it that the best evidence I can give that it is desirable to support Museums, is to show you that they will teach the community something worth knowing; as the same reason why libraries are universally supported is because everybody knows that we get from them information which we need, and which is both useful and interesting.

Now, these general divisions of the animal kingdom are, first the vertebrates. They are the animals to which I alluded before, beginning with our quadrupeds, including man, and the birds, and next to them the reptiles, and even the fishes. For these four classes of animals are constructed upon one and the same plan. There is no more difference in the architecture of a fish and the architecture of a bird, or a quadruped, or even a man, than there is between the general plan of constructing dwelling houses, in which the only differences are introduced in the number of apartments and the various divisions for various purposes, introduced in the plan. As we ascend from the solid wall, to make a building, so are all the animals called vertebrates built upon one plan, which is this: Solid cases, or backbones, above which rises a number of arches surrounding, in the front part, the brain; and behind the spinal marrow; another series of arches underneath, enclosing a marrow, the chest, the abdominal cavity, and all the other organs; and of all these arches, whatever be their form—whether long, like a fish, or in the shape of a bird, the body is raised on four longer legs. The structure is identical in all of them, and differs in the plan of structure which we observe in any other of the great divisions of the animal kingdom.

The next division, the articulates, embrace the worms, the crustaceans, and insects, the whole body of which is like a hollow single cavity. In the crustaceans, the body consists of a three joints, and the anterior region is more developed and has larger legs; and the posterior one is less developed and has only swimming appendages. And we have a third class, which differs in having a different number of the rings. Now that external form is a feature of little consequence, for that which characterizes the plan of these animals is a slender form of successive rings joined together; and all the difference consists in the mode in



believe, and the organized body which is about to  
begin its existence. Then we learn the whole  
process in which the anterior region of body is broad  
and short, and the tail is reduced so that it is hardly  
visible, and is bent down under the body; while the  
large three round lobes. Now, here again we can  
trace very readily the relation of these three pro-  
cesses. Looking at the structure of the nervous sys-  
tem, we find a gradient, the end being the highest.  
These kinds of processes fit together, and by so we  
what we find in the past. In the relations at Toronto  
Park we find conditions in which the anterior  
region is well marked; followed by a number of  
intermediate ones which are more numerous, and grad-  
ing into another more posterior pair. The structure  
of the whole seems analogous to the last systems  
of our day. It is only in the more biological per-  
spectives that we can properly see the higher kind of  
processes. When the egg of the crab is laid, the  
whole form is shape very similar to the shrimp,  
when it has grown larger, the anterior increases dis-  
proportionately, and it passes about the time of being  
laid in the form of the lobster; and every young  
crab may be mistaken in its embryonic state, or when  
just hatched, for a miniature young lobster; and  
then when its anterior grows larger and larger the  
crab form is developed. As we find that the crab  
grows in an other way, and that its tail is made to  
end in eggs, the very kind of eggs will produce  
nothing but the present, and that the young crab  
becomes a lobster as a shrimp, namely a crab after  
passing through all these phases can be noticed  
that the relation never gives any anything but what  
they are intended to be. We have the additional evi-  
dence here, as with the mandala, that the thought  
which called these animals into existence, made also  
clear to the plan according to which these animals  
should grow in our time.

And if we go to another example, with which we  
are intimately acquainted, the fish, we find that its  
egg produces only the kind of animal to which they  
are laid, and yet I have shown you that they are con-  
sidered upon the same plan as the spider, and the bird  
like the quadruped, and the quadruped like man. The  
young fish, before it assumes the form of the fish,  
may be mistaken by the relation for a turtle or a  
chicken. And yet we know that chicken's eggs never  
produce anything but chickens. When we find that  
a young chicken may be mistaken for a fish, where is  
the direction for the organism that becomes fish?  
we find evidence, they like birds, they lay quadrupeds,  
and they lay men, that they have grown out of  
the water? When it appears that it is the last of Na-  
ture to take a quadruped form, and that it never  
takes any other, what leads it there for an organism  
that was laid in an animal was grown out of and which  
has related before?

But there is an argument yet brought forward,  
the argument of the very birds to which I alluded,  
namely in my operations, and about which I will say a  
few words. Now Nature has to modify animals. It  
seems to be that the particular kind which be-  
comes. The things have to have shape and how to  
beard them. It is not how to produce animals that  
will have the form before. It is Nature's, it is for  
the species of doing it. In what way? I can  
by showing you how these same organisms which  
have the quadruped form produced, and using them as  
a breeding stock, and propagating in them these  
organisms which are made under some other  
kind of animals. And very quickly Nature has to  
produce new forms and varieties. All these  
things can be done by man. The great argu-  
ment is that Nature has the same mode of pro-  
cedure, and will accomplish the same objects. With  
the difference. In the one case man acts with a pur-  
pose, and we watchful of the end. In the other it is  
instinct and chance. Now we find that through-  
out Nature there are conditions, which give evi-  
dence of a plan, we have seen that there is three an  
Agency of work very thousands that have produced  
what they may make in the form of garden, but yet, it  
is an agency. It is not to look every, and if man  
can improve his work, it is because he has mind, and  
the more intelligent a farmer is, the more profitable  
he will be. But if he leaves the matter and the  
agency to make his plan, he will see that Nature in  
its wild operations will the farmer his farm, any  
more than Nature will produce any new man.

And so I say that Nature teaches us everywhere  
the same instruction of our intelligent being  
—Nature and all—without—the creature is in-  
tentional will, according to a fixed plan, and that  
we have seen in the study of Nature under  
varieties of them which we have learned whatever  
is true and false, and that whatever should be so  
longer considered as literature of words of Nature, but  
as literature of words of God, in which we may read  
the thoughts and feelings which breathe with him in  
the Father of all things, and we ourselves learn  
by that language, I see that man's work is never  
the inheritance of his created nature; and I hope to  
see so long enough to see the time when every  
school shall have its book, wherever, or it has been  
to any thing.