

system may be explained in a manner pleasant to the youngest child.

But I have undertaken to address you upon the desirableness of introducing the study of natural history in our schools, and of establishing that instruction as a means of developing the faculties and as a means of leading the child to the knowledge of the Creator, and I will now turn to the point of my address.

Natural history, I have already said, should be taught from objects and not from books, and you see at once that this requires teachers who know these objects, and not merely teachers who can read and see whether the lesson set has been committed faithfully to memory. The teacher must know these objects before he can teach them. And he ought to bring them into the school, and to exhibit them to the scholars, and not only that, but to place them in the hands of each scholar.

Some years ago I was requested by the Secretary of the Board of Education, to give some lectures on natural history to the teachers assembled in different parts of the State, in those interesting meetings known as teachers' institutes; and I had been asked to give some instruction on insects, that the teachers might be prepared to show what insects were injurious to vegetation and what are not, and that they might impart the information to all. I thought the best way to proceed would be to place the objects in their own hands, for I knew that mere verbal instruction would not be transformed into actual knowledge, that my words would be carried away as such, and that what was needed was the impression of objects. I therefore went out and collected several hundred grasshoppers, brought them in, and gave one into the hand of every one present. It created universal laughter; yet the examination of these objects had not been carried on long, before every one was interested, and instead of looking at me, looked at the thing. And they began to examine and to appreciate what it was to see, and see carefully. At first I pointed out the things which no one could see. "We can't see them," they said. "But look again," said I. "for I can see things ten times smaller than these;" and they finally discerned them. It is only the want of patience in the difficult art of seeing, that makes it so much more difficult.

The power of the human eye is very great, and it is the want of training which sets so narrow limits to its boundaries. After having examined one object minutely—one of those objects which can be seen everywhere—take another, one which has some similitude to it. Analyze its parts, one after the other. Point out the difference which exists between this and that examined before, and you are at once on the track so important in all education, which exists in comparisons. It is by comparisons that we ascertain the difference which exists between things, and it is by comparisons, also, that we ascertain the general features of things, and it is by comparisons that we reach general propositions. In fact, comparisons are at the bottom of all philosophy. Without comparisons we never could go beyond the knowledge of isolated, disconnected facts. Now, do you not see what importance there must be in such training; how it will awaken the faculties, how it will develop them, how it will be suggestive of further inquiries and further comparisons, and as soon as one has begun that sort of study, there is no longer any dullness in it. Once imbued with the delight of studying the objects of nature, the student only feels that his time is too limited in proportion to his desire for more knowledge. And I say that we can in this way become better acquainted with ourselves.

We can understand our own nature, our relations to the world at large in a better manner. We can know how we are related to the whole animal kingdom, if we once begin that kind of comparison. At first, it may seem difficult to find any resemblance between man and quadrupeds, between quadrupeds and birds, between birds and reptiles, between reptiles and fishes; and if we were to attempt to compare a fish to a man, it would seem preposterous. And yet the two are constructed on the same plan. The same elements of structure which we may see in the fish are, only in a more lofty combination, presented again in the man; and it may be shown in the simplest manner that there is one single gradation leading up from the fish to the noble stature of man. And these comparisons are the best means of developing all our faculties, because they call out not only the powers of observation, but the ability of man to generalize, and at the same time to discriminate. They call into effect all those abilities which distinguish men from men, which give men power over other men, and give men the power of discriminating judiciously, and of combining properly all the ability of discerning differences, as well as resemblances; one constitutes the art of observing, while the other constitutes the art of the philosopher.

The difficult art of thinking can be acquired by this method in a more rapid way than any other. When we study logic or mental philosophy in text-books, which we commit to memory, it is not the mind which we cultivate—it is the memory alone. The mind may come in, but if it does in that method, it is only in an accessory way. But if we learn to think, by unfolding thoughts ourselves from the examination of objects brought before us, then we acquire them for ourselves, and we acquire the ability of applying our thoughts in life. It is only by the ability of observing for ourselves, that we can free ourselves from the burden of authority. As long as we have not learned how to settle a question for ourselves, we go for authority, or we take the opinion of our neighbor; that is, we remain tools in his hands, if he chooses to use us in that way, or we declare our inability of having an opinion of our own. How shall we form opinions of our own otherwise than by examining the facts in the case; and how can we learn these facts, which are unchangeable, those facts over which man, with all his pride, can have no control?

Man cannot make the sun to start off and move in space; man cannot change the principles of the solar system; he cannot make plants sprout out of their season; he must take the phenomena of nature as they are. They should teach him humility and truth. He should learn that what exists in nature is true, and that to learn to follow truth he must bow to what is; he must bow to what he cannot change from the nature of things; but at the same time, he learns how to ascertain what is, and how things are; and while he learns that, he acquires a power which afterwards can neither be checked nor lessened, and which is ever improving, in proportion as opportunity for further observation is increasing. I will select a very trivial case to show you in what way we may reach a question from the observation of special facts. Let us take an earthworm. [Prof. A. here drew on the blackboard representations of the things described.] It is a cylindrical elongated animal, with transverse rings all along. Upon each of these rings are stiff bristles, standing out in opposite directions, by the motion of which the animal moves along.

Let us examine the lobster. Here we have another animal, with a body, tail, legs, and a variety of appendages in the shape of claws and legs. It has no resemblance to the earthworm. Let us examine the wasp or bee. Here we have an animal still different. It has wings, and it presents three different regions of the body, and yet it is constructed on the same plan as the others. Let us see what they have in common. There are a succession of rings, one upon the other. If we examine the maggot, from which the wasp is hatched, we shall find that it much resembles the earthworm, but as it grows, there are fewer rings round the body. [The similarities and differences of the three animals were described at length.] They have, at the commencement, these things in common—a cylindrical body, divided into a number of joints, which are moveable one upon the other. We have, therefore, reached the general proposition, that all these animals have a common structure; that they are all built upon a common plan, and that the elements of the structure, the architecture of it, consist merely in the combination of rings. The difference arises only in the progress of growth, and they increase in every region until we have as complicated an animal, superior to the worm, as the lobster is superior to the bee or wasp.

How was the discovery of these facts accomplished? First, by an observation singly of these things, one independently of the other; then by a comparison of all the successive stages of growth of one with the successive stages of growth of the other; then by comparison of all the features with one another; and then we reached the general conclusion, that there was but one plan of structure of the whole; but as soon as we have reached this generalization, we have at once also come to the conviction, that between animals organized on this plan there can be no similarity to the animals organized on any other plan. We find that our frame is built in a very different way. If we begin to analyze the difference, then we see that what distinguishes man is his head and brain, his middle body and limbs. It would not be a difficult thing to show, that the same bones are found in quadrupeds as in man; and that their limbs and organization correspond. It only shows that the Great Architect knew how to apply the same means to purposes as different as walking and flying. Even in fish, the fins are only modified arms and legs, and are constructed on the same plan of arrangement, as may be distinctly traced by any person who would for a moment establish a comparison for himself, not merely by speaking these things, telling them in a school-room—but only where the bodies of the animals are at hand to show them. If you use a specimen in place of a text-book, you will exhibit the similarity which exists between animals constructed on this plan,