

The teaching of the sciences *ex cathedra* and science itself are things so different that the one may be regarded as so much opposed to the other as the active is opposed to the passive, or invention to memory.

Now, however, let us see in its working this intellectual gymnastics, for which these young men, according to Spencer, Bain and Huxley, are indebted to the teaching of the positive sciences.

A learned professor of chemistry enters his class-room, the subject of his lecture is affinity. The students take their pens and are all attention.

"In order," the professor begins, "to explain the union of simple, but different bodies, comprised in the same molecule, it is necessary to acknowledge the existence of a force, which has at first brought them in contact with one another, and which maintains this union when it has once been effected. This force is called 'affinity.'" The pupil, without knowing anything of the nature of this force, which maintains the union of the bodies, writes as rapidly as possible some verbal definition, which he endeavours to store in his memory. "Let us now examine the character of this affinity and the principal causes which modify it." The pupil writes—character—causes which modify. The professor continues, "In order that there should be this affinity between two bodies it is necessary that there should be contact; a very simple experiment will show this. Here is a solution of barytes in water, and here is a rod, the end of which I will dip into sulphuric acid. Sulphuric acid and barytes have a strong tendency to combine and form a white substance known as the sulphate of barytes." Another name to be engraved on the memory. "I approach the sulphuric acid to the surface of the fluid, but you see no combination has been effected. Now, however, I

touch the solution of barytes, and as the result of the contact you observe the sulphate of barytes is produced. It appears in the glass under the form of a white insoluble powder." * The pupils look, and the whole scientific effort, the entire induction, the whole result of the experiment is, so far as they are concerned, the presence of a white powder in the water. Certainly the experiment is interesting, perhaps amusing. What, however, has it done for the pupils? Has it afforded them the very least initiation into the methods which have led to the discovery of the beautiful law of affinity, or the philosophic connection of forces with one another, or the marvellous transformation of the one into the other. Each experiment, in physics or chemistry, however ingenious it may be, is quite determined and regulated beforehand; it unfolds itself as a description before spectators who are absolutely passive. They are not experimenters because they have watched its performance. They may have seen the turning of the wheel of an electric machine, or the process of forming a vacuum by the means of an air pump, or that a heated ball cannot be made to pass through a ring, through which it passed a little before. All this is very well, but teaching by aspect is not teaching by *action*; our pupils do not act, they look, they take notes, and perhaps they write them out; but it is wholly limited to the taking of notes and seizing certain phrases. The mind has scarcely any further development even in a scientific connection.

But take the case of natural history. Here, indeed, the pupils come to learn, to observe, and to know things and, as Mr. Blanchard insists, "men."

Let us again listen. "After what we said in our last lecture concerning

* A lecture delivered in the Great Lyceum at Paris.