

vided the teacher is not expected to make much apparatus with his own hands. I cannot advise a teacher to undertake laboratory work if he must carry it on, without a teaching assistant, with squads of twenty-five or thirty pupils at a time. This experiment of very large squads has been tried in one or two schools that I know of, and with such results as were to be expected.

While strongly in favour of laboratory work for the whole class, yet I am not one of those who can see no good in the old text book method of instruction, properly supplemented by lecture table experiments. It is a great deal better than no instruction, and, in one respect, that of giving a general connected view of the whole range of physics, it is distinctly superior to the laboratory method, as the latter is sometimes practised. Laboratory work conducted with a mere manual of directions for experiments leaves woeful gaps in the pupil's knowledge. On the other hand, the text-book and lecture-table method used alone gives a comparatively superficial knowledge. The best method is a combination of the two. The student should concentrate his laboratory work upon a few well selected points of attack. These are the battle-fields, and from them the surrounding territory may be swiftly occupied, but occupied it should be. The geological parties of the Harvard summer schools do not undertake to walk over the whole country. They may explore in detail certain portions of eastern Massachusetts, of the Connecticut Valley, the Hudson Valley, perhaps parts of Pennsylvania, but they would certainly miss the full benefit of their labour if they failed to note the general features of the country between these points.

The young student in laboratory work, and the old one for that matter, is in danger of feeling, when his ex-

periment is finished, his observations arranged, and his result calculated, that he is done with the matter. Unless he is well looked after he will fail to draw the moral from his work. He will fail to note its applications and its connection with other parts of the general subject he is studying. It is, I suspect, a very general experience with teachers to be disappointed with the performance of their first class of laboratory pupils when confronted by written questions which they have not specifically dealt with in their experimental work. And so it happens that some teachers object to having a written test applied to the results of laboratory instruction. Of course the valuable mechanical experience and skill which result from school work cannot be shown upon paper, but the degree of intelligence with which the pupil does his experimental work may be ascertained perfectly well by a written test, and to object to such a test is to take an attitude too much like that of an ordinary handicraftsman, who dismisses any question relating to his business, but not touching points absolutely essential to the mechanical performance of his tasks, with the remark: "You are getting too theoretical for me. I'm practical." That spirit is proper enough for the craftsman. In fact, it is the spirit that prevents him from becoming anything more than a craftsman, but it is not the spirit in which boys should be educated. The teacher must see to it that, between the periods of their active occupation with apparatus, the pupils shall have time to think; and he must see to it that they do think. This he can accomplish only by setting them stated tasks that will exercise their brains, and bringing them to book on these tasks.

This seems to be the proper place to say, with regard to a notion that has had a certain vogue, that, if the object