PERIPATETIC SCIENCE TEACHING.

A very interesting experiment is being tried in Birmingham, by way of showing with what good results science can be taught to quite young children by a teacher who goes from school to school, and has his apparatus carried around with him. There is something very amusing to an American — it would be hard to say exactly why — in the description given in *Nature* of a 'strong youth' dragging through the city his 'hand-cart' laden with apparatus, and, when he reaches a school, unpacking it, spreading it out on a table, and retiring at the moment the demonstrator steps in. But after enjoying the local color of the picture, it may be well to ask ourselves whether the plan is not a good one, and deserving of imitation in our own public schools. In this country, no form of science-teaching is introduced, as a general thing, below the high school. The Birmingham course is given to children of from ten to thirteen years of age. One lesson fortnightly, of about forty minutes' duration, is given in the fifth and higher standards in each school. Between the visits of the science-demonstrator, at least one lesson is given to the class by the teachers of each school (as a rule, by a teacher who was present at the demonstrator's lesson, and who took full notes of it), and a written examination in the subject-matter of the lesson is also held. Most of the apparatus is of the simplest form, and so made that it can be taken to pieces, and examined in detail, by the children. Much of it Mr. Harrison has himself designed and had made for the purpose. His plan is to prepare working-models, pictures, and diagrams of pumps, for instance; to have the apparatus arranged on the table; and to draw from the boys what they know about pumps before telling them any thing. He then shows them the working of the machine, explains its principle, and reminds them of other instances in which they have seen the same principle at work. Before he comes to them again, the regular teacher goes over the ground once more; and then the boys write out what they have learned, and make drawings of the objects from memory. Some of the papers which we have seen showed a remarkable degree of intelligent comprehension; and one of the most interesting cases in the education department of the London health exhibition was that which contained a set of mechanical apparatus made by the boys at home with no better tool than a jack-knife.

The course extends over three years. For the last year, the syllabus covers the mechanical powers, liquid pressure, the parallelogram of forces, and the parallelogram of velocities. The second year is devoted to food, and to the warming, cleaning, and ventilation of the dwelling. The topics discussed in the eighteen lectures of the first year are not those which we should expect to find in a course on mechanics. The second lecture, for instance, is devoted to the human body, its structure, and the use of the microscope: and on succeeding days are discussed oxygen, hydrogen, nitrogen, amyloids, albuminoids; the composition of milk, eggs, etc.; wool as a material for clothing; hard and soft water; the skin; and soap and soda.

There are two distinct features in the Birmingham plan whose merits need to be discussed separately, — teaching science by means of a single teacher and set of appliances for several schools, and teaching it to very young children. With regard to the latter question, we shall have something to say at another time; but, whatever one may think about teasing children ten years old with such hard things as amyloids and albuminoids, there is no doubt, that, if it is to be done at all, it can be done best by a peripatetic teacher. Good science-teachers do not grow on every bush: and, when one has been found, it is a pity not to use him with as great economy as possible. Few of the teachers now in grammar-schools have received any scientific instruction: still less have they been able to acquire the methods, which are far more important than the facts. The attempt to teach the teachers *en masse* would probably not be very successful. There are comparatively few grown people who can go back to the child's delight in asking

questions of the things themselves. They do not care to pull the doll or the toy to pieces: they would rather be told what it is made of than take the trouble to examine it. The element of curiosity seems to have been educated out of them, and their only idea of teaching elementary science is to give the children as many facts as possible about things which they know only by their definitions. Until, then, the present happy generation of children has grown up and become ready to teach science by scientific methods, it seems evident that the plan of itinerant teaching has much to commend it. It is a plan, moreover, whose advantages ought not to be confined to the grammar-schools. Instead of putting a single overworked teacher in charge of all possible sciences in a high school, specialists might be found who would go from school to school, and carry with them an enthusiasm which it is impossible to feel for a very wide range of subjects. The Johns Hopkins university has already tested the excellence of the method for higher schools of learning. It is not impossible that the smaller colleges would gain by it if they were to adopt the plan of making occasional exchanges among their professors. In no other way could they so easily secure the specialization which is necessary for the best teaching.

AN ESTIMATE OF GENERAL GORDON'S SCIENTIFIC CHARACTERISTICS.

IN our eagerness to honor a hero, there is some danger that Gordon's fame may suffer temporary injury, and that his character and the nature of his deeds may be seriously misunderstood. The popular notion seems to be, that he lived in a state of mystical exaltation, and won his strange successes by powers and processes incomprehensible, if not supernatural. Recent writing about him has dwelt so particularly upon his religious fervor, and much of it has been so intemperate and indiscriminating, that it is not strange that some shallow pamphleteers should have classed him with the prophets. He was a hero. Besides that, he was a highly educated, disciplined, and painstaking officer. He inherited military talent, and love for his profession, from generations of soldiers, and he was trained in that thoroughly scientific corps, the Royal engineers. For the first three years of his service under the khedive, he kept careful itineraries of all his marches, and, being a fine topographer, he made solid contributions to our knowledge of the geography of the upper Nile country. I have before me a dozen sketch-maps of the equatorial country, drawn by his own hand with uncommon skill. He was fond of illustrating his letters and memoranda of instructions with geographical and topographical sketches. He was minutely careful in his arrangements for solidifying and extending his communications and positions, fertile and ingenious in applying his knowledge. If we ever learn the details of his defence of Khartum, we shall probably be as much astonished by its mechanical side as by its higher intellectual and moral qualities.

From the beginning of his career before Stevastopol, "He had a personal knowledge of the enemy's movements, such as no other officer attained." His knowledge of the people of the Sudan, of their sheiks and fakirs, and of the Egyptian officers serving there, was remarkable. He had great capacity for detail; but his mental processes were so rapid, and his perceptions so keen, that he was often thought illogical by those who could not keep up with him. He was often misjudged, too, because he would not bother to explain all his steps.

Far from being a mystic, he was wide awake and practical. In Africa and in China he was constantly vigilant in keeping his powder dry. The clothes, food, pay, and sanitary conditions of his soldiers were diligently watched over. The infirmities of temper of his subordinates were well understood and provided for. His campaign in China may well be studied as a shining example of skilfully planned warfare; and his scheme for the better government of the Sudan involved twelve years of logical and systematic development, before its effect could be fully felt.

Let no one think that Gordon mounted his camel and rode into the desert, or seized his stick and led his rascals up to the mouths of the Chinese cannon, with a magnificent but blind faith. He was a laborious student of the problem in hand, he had a keen intelligence, his judgment was prompt and accurate, he was patient and far-seeing, his will was indomitable; but, above all, he had eliminated himself entirely from his problem. This made Gordon great. He could see what other men could not, and do what they dared not, because he was as unselfish as a human being can be.

H. G. PROUT.