SCIENCE-TEACHING IN ENGLAND.

MR. J. H. GLADSTONE, in an article in *Nature* of May 2, on the new code of the Education Department,[1] which was then before the House of Commons, says that never, since the famous proposals of Mr. Mundella, has there been so much stir among those interested in primary instruction as at the present moment. The reason is not far to seek. For some years a royal commission has been sitting and taking evidence, and it has produced several bulky Blue Books during the course of the past year. It was known that the commission was divided into a majority and minority who were strongly opposed to one another on certain questions of policy. This has found expression in lengthy reports and contradictory recommendations; but, to the satisfaction, if not to the surprise, of educationists, it is found that on purely educational matters there is an almost perfect unanimity between the two sections. It was therefore a matter of deep interest to see how, and to what extent, these recommendations, signed by every member of the commission, would be embodied in the proposed code of 1889.

There are several alterations in this code which are almost universally allowed to be improvements; but it is conceived in a spirit of compromise, and perhaps no party is entirely satisfied with it. The only point to be considered is the aspect of the code towards the teaching of natural science. It may be convenient to group Mr. Gladstone's observations under different headings.

I. The direct changes proposed in the teaching of science. These are almost confined to one or two modifications in the geographical schedule, and to a provision that "scholars of any public elementary school may attend science classes held at any place approved by the inspectors." This may be very useful in towns, especially as it will admit of the formation of central laboratories or workrooms similar to the present cookery centres.

II. The proposed changes which will tend to facilitate the teaching of science. There are four subjects of instruction which are termed "class-subjects," — English (including grammar, composition, and repetition of poetry), geography, elementary science (a progressive course of object-lessons), and history, — together with needle-work for girls. Only two of these class-subjects can be taken for examination, and, under the old code, English must necessarily be one of those chosen. The consequence of this is, that elementary science has never got a footing in the schools in England; for, even where two class-subjects are taken, they are nearly always English and geography, or English and needle-work. The supremacy of English is now to be put an end to, so that any teacher may now take elementary science, if he or she should prefer it, and earn a grant.

The enormous waste of time and patience in making little children, even in infant-schools, learn the spelling of common words, is to be reduced. The inspector is to give no dictation exercises to boys and girls under the second standard. This will give more time for object-lessons and other valuable modes of instruction. Some relaxation of the literary requirements are also made in the case of evening-schools.

The present system of payment by results is to be so modified that the cramming in the three R's will not be so profitable, and there will be more chance for intelligent teaching. One of the matters also to be taken into account by the inspector, in assessing a school, is the provision of apparatus, though this need not necessarily have any thing to do with what scientific men would call by that name.

These proposed changes are in the right direction, but the value of many of them will largely depend upon how they are understood. There is a singular want of clearness in some of the clauses. The annual instructions to inspectors have not yet been drawn up, and indeed it is very improbable that they will make their appearance until after the code has become law. It is quite possible to take away with one hand what is given with the other. The present agitation is therefore of great importance not merely in getting modifications of the code when discussed in Parliament, but in inducing the Education Department to give their inspectors such instructions as shall secure that the greater liberty of teaching should be a reality; that the ominous word "repetition," introduced into one or two paragraphs, may not become "English" in disguise; and that the spelling of the second standard should not involve a laborious preparation of the younger children.

III. These alterations bearing on the teaching of science fall far short of what the royal commissioners unanimously recommend. The report of the majority states that "some elementary instruction in science is only second in importance to the three elementary subjects," — namely, reading, writing, and arithmetic, — and it places among subjects regarded as essential, "geography (especially of the British Empire); lessons on common objects in the lower standards leading up to a knowledge of elementary science in the higher standards." It adds, "that geography, if properly taught, is a branch of elementary science, which should not be separated from the other branches, and might well be taught along with the object-lessons, in accordance with the recommendations of the Royal Commission on Technical Instruction; that the curriculum in the ordinary elementary schools might often include not only instruction in the elementary principles of science, but also, in certain standards, elementary manual instruction in the use of tools, and in higher schools and evening-schools this work might be carried still further; that, in making future appointments to the office of inspector, it would be desirable, in regard to a larger proportion of them than at present, to give special weight to the possession of an adequate knowledge of natural science." The members of the minority express themselves, if possible, more strongly, and make such additional remarks as, "We are of opinion, that, after the children have left the infant-school, transitional methods should be adopted, which will develop their activity and train their powers by drawing in all cases, and by such other means as, for instance, modelling, or the collection and mounting of botanical specimens. . . . If science is to be well taught, care should be taken, that, where the ordinary teachers are not qualified, specially trained teachers should be employed." In respect to technical schools they say, "These schools, which should be the crown and development of elementary education, should be in touch and close sympathy through their management with our elementary school system."

IV. The proposals of the new code also fall far short of what the principal school boards are attempting. Spirited efforts are made in Birmingham, Manchester, Sheffield, Brighton, and other provincial towns, in establishing higher elementary schools with useful scientific teaching. The London Board determined from the commencement that object-lessons leading up to science subjects should be given in all its schools. It has repeatedly contended for the official recognition of such lessons; and it has lately sent a memorial to the Education Department, asking that the regulation at present in force in the infant-schools, that, in assessing the grant, regard should be had "to the provision made for simple lessons on objects and on the phenomena of nature and of common life," should be extended to the boys' and girls' departments.

The reforms decided upon by the London Board last year, with the view of making the teaching more experimental and practical, and not so much a matter of book-learning as a development of intelligence and skill, are being gradually put into operation.

It has also for some years carried on a few classes for manual instruction in the use of tools with good success, but its efforts in that direction have been nearly paralyzed by the disfavor of the legislature. This seems a necessary step towards the technical education which is now loudly called for; but in the new code we look in vain for a word of encouragement.

Some of the larger boards have carefully provided good instruction in natural history, and in the fundamental principles underlying mechanical, physical, and chemical science, for their pupil teachers, though that does not appear upon the government schedule.

V. What is wanted is a far more liberal recognition of the claims of science in elementary education. At present, object-lessons or certain sciences are, no doubt, recognized by the code; but it is merely as an additional subject of instruction not comparable with the literary subjects which are considered essential, and which occupy the great bulk of the scholars' time. The knowledge of nature is, in fact, totally neglected in hundreds or thousands of

[1] Code of Regulations, with Schedules, by the Right Honorable the Lords of the Privy Council on Education (London, Eyre & Spottiswoode).

elementary schools, especially in country districts, where it would appear to be even more important than in towns. A boys' or girls' school can obtain the highest credit in the inspector's report, and the highest possible grant of money, without its scholars having ever heard of animal or plant, or of those materials of the world, or of those natural forces, with which the scholars will have to deal all through their lives; and, what is perhaps still more anomalous, those pupil-teachers who are possibly expected to give object-lessons in their schools are never examined in natural history by the department, and may gain a high place in their examinations without the least knowledge of any kind of natural science.

It seems most desirable that every little child who enters school should be led to observe and inquire; its curiosity and activity should be encouraged and directed; only when its senses have been made acquainted with things should it be introduced to the words by which they are called, first orally, then in writing or print. It should proceed from the concrete to the abstract. The works of the Creator are as worthy to be studied as the words of men, and should hold as high a place in any school curriculum.

The reply of the department to such requests as these will probably be, "We cannot assume that the teachers are capable of teaching, or the inspectors of examining science." No doubt there is that difficulty. But many of them are capable, and they are all presumably intelligent men, who would easily learn what might be required of them. Special teachers of science also exist, and special examiners might be appointed. It may not be possible to insist on all these reforms at once, but at least encouragement should be held out to them, instead of the disappointing uncertainties of the code now before Parliament.

HEALTH MATTERS.

Tuberculosis Contagion.

DR. VON DUHRING reports to the *British Medical Journal* a case of tuberculosis which was contracted by wearing a pair of earrings. The patient, a girl of fourteen years, removed the earrings from the ear of a young girl who died of consumption, and wore them in her own ears. Soon after, an ulcer formed in the left ear, the discharge from which, when examined, was found to contain tubercle bacilli, and a gland in the neck also enlarged and ulcerated. The patient developed pulmonary consumption, and at the date of the report was sinking rapidly.

This case is one of great interest as showing another channel by which the bacilli of tuberculosis may enter the system. The inquiry will naturally suggest itself, whether this patient was not already phthisical at the time she began to wear the earrings, and the development of the disease at that time a mere coincidence. This would seem the more probable from the age of the patient, which was fourteen years. Then, too, the report states that these two girls were intimate friends, so that the seed may have been sown during their lifetime. Some years ago either of these explanations would, to most minds, have been sufficient; but, through the researches of Koch, an additional means of determining the question has been made available. This is the detection of the bacilli themselves. The report states that this was done in the case mentioned; and, as the methods are simple and decisive, there is no reason to doubt the accuracy of the report. The enlargement of the gland in the neck is additional evidence that the earrings were the source of the infection. It would be interesting to know whether the ears of the first patient were ulcerated or not.

ELECTRICAL NEWS.

ELECTRICAL COURSE AT COLUMBIA COLLEGE. — In view of the prodigious strides which electricity is now making, it is but natural that the necessity for the establishment of a means whereby its thorough and systematic study can be undertaken should have engaged the attention of educational bodies in this country. Columbia College, which has always occupied a prominent position in science, has now established a course of electrical engineering. As its professors, it has secured the services of two men of excellent repute in electrical and mathematical circles. Mr. Francis B. Crocker, who assumes the instructorship, is no stranger to many of our readers. As one of the inventors of the C. & C. motor, his name has for some time been conspicuously before the public; and his papers read before the American Institute of Electrical Engineers (among which may be specially mentioned that on "Chemical Generators of Electricity," last year) and other scientific bodies have never failed to meet with a welcome. Mr. Crocker is regarded as a rising man in electrical circles; and in this view it is significant that he was, a few weeks ago, elected to the presidency of the New York Electrical Society, which is the oldest organization of its kind in the country. Mr. Michael Pupin is the assistant instructor. From Mr. Pupin's past work and present reputation, great things are expected of him, and he brings to his new sphere of action the additional prestige of having studied under Helmholtz in Berlin.

NOTES AND NEWS.

DURING the past year the director of the Michigan Weather Service has had compiled the average monthly rainfall for each section of that State, and has had the figures published in the monthly report. Believing that the information thus compiled could be better shown by being charted, the director made a chart of the State, showing the average monthly rainfall for each month and for the year. These charts were made up from the observations of thirteen years, and about four thousand reports were examined and proved, to obtain the data. There were also made the charts of the monthly and annual rainfall for the past year which are to accompany the normal charts. These charts will be of great value to the people of Michigan, as the rainfall can be readily compared with the normal, and thus ascertain in each locality whether the rainfall has been the average or not.

— Professor Rosenthal of Erlangen, at a meeting of the Berlin Physiological Society, March 27, gave an account of calorimetric experiments with which he had been busied for the last few years. He employed in these, says *Nature*, an air-calorimeter of special construction. It consisted of a copper vessel, of easy ventilation, in which the animal was placed; this was surrounded by an air-tight envelope, filled with air and constituting the reservoir of an air-thermometer; external to this was a covering to shield the whole apparatus from any changes in the temperature of the surrounding atmosphere. When the animal gives up to the envelope of air, per unit of time, exactly the same amount of heat as the whole apparatus radiates into the surroundings, the temperature of the air in the envelope remains constant, as also its pressure: hence the heat produced and given off by the animal during any known time could be measured by means of a manometer. Notwithstanding that the dog used in the experiments was fed in exactly the same way at each meal, the quantities of heat produced varied very largely, and any considerable uniformity is only obtained by taking the mean of a long series of observations. Up to about the third hour after the meal, the heat-production diminishes, then rises rapidly to a maximum; and from this point, at about the eighth hour, it begins to fall again slowly, and with irregularities, until the next meal. Over the whole twenty-four hours the heat-production is more uniform during the second period of twelve hours than in the first; about 20 per cent more heat is produced during the first than during the second half of the whole day. When an excess of food was given, the heat produced was always less than that calculated out from the oxidation of the food itself; but, with a uniformly constant diet, the mean value of the heat produced corresponded to the heat calculated for the oxidation of the food. The amount of carbonic-acid gas given off by the animal was found to correspond to the heat given off during the same period only in cases where prolonged intervals of time were taken into account. When the surrounding temperature varied between 5° and 25° C., all other conditions remaining the same, a minimum production of heat was observed at 15° C.: from this point it increased uniformly in both directions, not only when the temperature fell to 5° C., but also when it rose to 25° C. Professor Schweigger demonstrated several pieces of apparatus, which, by the use of small incandescent electric lamps, could take the place of the ophthalmoscope, and even