questions may be called "very easy," yet there are others quite sufficiently difficult for the ordinary public school-boy, who has a great many other things to work at besides natural science.

A boy must have read his chemistry thoughtfully, to say the least, who could answer the whole of Question 1 thoroughly. In Question 2 there is ample opportunity for showing a deeper knowledge than could be obtained by skimming over some "outlines of chemistry." So again the explanation and illustration of the peculiar oxidising and reducing properties of *nitrites*, in Question 4, and the description of the preparation and properties of the different bodies enumerated in Question 8, could, I maintain, only be given satisfactorily by boys who had acquired something more than a mere "modicum" of chemical knowledge.

It must also be borne in mind that in order to pass the Chemical Division of Group IV., a boy must take in, in addition to the chemistry of the metallic and non-metallic elements and practical analysis, either heat or magnetism and electricity.

Now although there may be reasons for combining together heat and chemistry, so long as it is understood that only the more elementary parts of heat will be required, yet it is certainly unreasonable to add on as an extra such a very comprehensive subject as that of magnetism and electricity, frictional and voltaic, including electro-magnetism.

Surely, to say the least, electrical science is quite as worthy of an independent existence as botany or geology, and I much doubt whether many would hesitate in admitting it to be much harder than either.

My own opinion is in favour of Mr. Wilson's suggestion—to divide Group IV. into Pass subjects and Honour subjects, requiring only an elementary knowledge of theoretical chemistry, and perhaps the simpler parts of heat for the one, while practical analysis with higher knowledge of heat, *or* electricity and magnetism, might be required from those who aimed at taking honours in science.

It is perhaps due to the school to say that we can hardly be supposed to be frightened at the prospect of these examinations. Last July three in the Sixth took in chemistry as a certificate subject: all passed and two obtained "distinction"—three being the total number who obtained such distinction out of the twenty-eight candidates who presented themselves for examination in this subject. T. N. HUTCHINSON

Rugby

In my letter last week, p. 329, I said that the papers set in science in the certificate examination *last year* were very easy. This was a slip. I was absent from England when they were set, and had never seen them. I had in my mind the papers of the year before.

The papers of last year were quite hard enough. It must be remembered that very many schools give only *two lessons a week* to science. JAMES M. WILSON

ANNIVERSARY ADDRESS OF THE PRESIDENT OF THE ROYAL GEOLOGICAL SOCIETY, JOHN EVANS, F.R.S.

MR. EVANS began by referring to the immense advances in geological science since 1825, when the Society received its charter, and pointed out that although there now existed a considerable body of professional or trained geologists, yet amateurs need not be discouraged from taking up the science which now embraces so wide a field that there is ample room for both. He then referred to the prosperity of the Society, to its publication, its medals, and other means for fostering the science, and to its valuable museum, an "interesting notice of which," he intimated, "appeared in NATURE, vol. xiii. p. 227." Mr. Evans then spoke of the present prospects of the science, of the bearing which recent discoveries in other branches of knowledge has upon it, and of the direction in which future discoveries are likely to be made. In this connection he referred to the recent researches in solar physics by means of spectrum analysis and solar photography, as having a close and intimate bearing on the early history of the earth, and which was discussed by Prof. Prestwich in his inaugural lecture at Oxford (NATURE, vol. xi. p. 290). He spoke also of the importance of spectrum analysis to the metallurgist, referring to the researches of Mr. W. C. Roberts in quantitative analyses of gold-copper alloys. Mr. Evans then spoke at some length of the important results already attained by the *Challenger* Expedition as to the nature of the sea-bottom. In speaking of the Arctic Expedition, from which geology hopes to gain much, he referred to the powerful evidence which exists in the fossil flora of Greenland and Spitzbergen, of the prevalence in the Arctic regions at one period of a distinctly warm climate.

Mr. Evans then went on to say:—The three points which it appears to me are most important to bear in mind with regard to the Arctic flora are:—1, That for vegetation such as has been described, there must, according to all analogy, have been a greater aggregate amount of summer heat supplied than is now due to such high latitudes; 2, that there must have been a far less degree of winter cold than is in any way compatible with the position on the globe; and 3, that in all probability the amount and distribution of light which at present prevail within the Arctic circle are not such as would suffice for the life of the trees.

Should the present Arctic expedition succeed in finding traces of what must be regarded as a temperate, if not indeed a sub-tropical fossil flora, like that of Greenland, and Spitzbergen, extending to latitudes still nearer the pole, it does appear to me that geologists will be compelled to accept as a fact that the position of the axis of rotation of our planet has not been permanent; and they will have to call upon astronomers to find some means of admitting what they now regard as impossible.

An astronomer and mathematician of no mean ability, the late Sir John W. Lubbock, in a paper communicated to this Society in 1848, has speculated upon this subject, which was in consequence discussed by the late Sir Henry Delabeche in his Presidential Address in 1849.

Sir John Lubbock remarked that the dictum of Laplace as to the impossibility of accounting for the changes which have taken place on the surface of the earth, and in the relative positions of land and water, by a change in the position of the axis of rotation, was founded upon the absence of two considerations, both of which appeared to him essential. These were—

1. The dislocation of strata by cooling,
2. The friction of the surface.

The latter consideration is apparently of but little importance; but with regard to the former, he pointed out how, if from any cause the axis of rotation did not coincide with the axis of figure, the pole of the axis of rotation would describe a spiral round the pole of the axis of figure until it finally became, as it is at present, identical with it. He considered it unlikely that originally the axis of rotation should have coincided exactly with the axis of figure, unless the whole globe were perfectly fluid; but added that we might go back to a time less remote, when the earth was in a semifluid state, and in consequence of the different degrees of fusibility of different substances, was partly solid, in irregular masses, and the two axes did not, in consequence, coincide. We might, he added, assume the original state of want of uniformity between them to have been at a period even more recent, when the earth consisted of land and water, and was suited for the support of animal life. He then proceeds to show how, if, after any length of time the solid spheroidal part of the earth moved about any new axis of rotation, the water would occupy a new position about a new equator, land would become sea, and sea land, &c.

He adds that if the axis of the earth would suffer a displacement by reason of the causes which produce the precession of the equinoxes, we should have another and more natural way of accounting for the existing phenomena; but this has been held to be impossible.

I am not at present going to question whether this holding is correct; but with regard to Sir J. W. Lubbock's reasoning as to the necessity of the axis of figure coinciding with that of rotation, it appears to me of the greatest importance; for if it hold good, any alteration in figure cannot but have some effect on the position of the axis of rotation. No doubt, if the whole globe, or even the solid portion of it, were a regular spheroid, with a large