

Dr. Walker said he saw an obelisk on top of a hill struck. The top was knocked off, and the fluid came from the steps of the monument at fourteen different points, ploughing up the ground, and breaking rock at 100 feet distance.

Mr. Wood thought the black flash shown in one of the photographs was due to the reflection of one of the other flashes.

Lord Rayleigh said Stokes attributed that to the combination of gases in the path of the flash causing an opaque stratum.

Prof. Lodge said he could not understand why a conductor should have such a good earth. Why did not three points do at the bottom as well as at the top? If properly-constructed conductors never failed, how was it that the hotel at Brussels was burnt, for that was considered protected in the most orthodox way? He would not say that conductors were of no use; they were of great use, but not absolutely certain. In his experiment he was bound to adopt the plan he did, because the experiments could not be done in any other way. It was only the outer surface of the conductor which conducted, and there was no particular good in the centre of a rod. A tube would do as well, and would be all the better if opened out into a flat bar, and yet better than that would be a strand of wires. Iron buildings, to be safe, must have perfect connections, for the smallest gap might give off a spark. That was the danger in houses supplied with gas; if the fluid travelled along the pipes and came to a gap, a spark and a fire might result.

Mr. Preece said the points between Prof. Lodge and himself were reduced to a very small compass indeed. He himself had always been a great advocatè of iron on account of its cheapness. The use of copper caused needless expense in the erection of lightning-conductors. He believed every private house could be protected in accordance with the recommendations of the Conference for £1, if people would buy a coil of stranded iron wire a quarter of an inch in diameter, with the final points, and have that put up.

The President summed up the discussion, and said the principal thing for them to pay attention to was that prevention was better than cure. There could be very little doubt that the presence of a considerable number of conductors afforded a great deal of protection to the area in which it existed, as was shown in the instance of Paris. It was desirable, if possible, that the whole country should be covered with conductors to prevent the discharge of flashes. There was no doubt that, though there might be room for improvement in the conductors, they had on the whole been right.

THE INTERNATIONAL GEOLOGICAL CONGRESS.¹

II.

IN order to understand the present status of the Congress, and to forecast its probable future, we must briefly note the work done at the two preceding meetings, and compare that with the general results of the meeting just closed. At Bologna the greater part of the time was occupied with discussions upon the exact meanings to be attached to various geological terms, and upon the general principles which should guide us in geological classification. Certain rules were then laid down, which probably few authors have consistently followed, and which it is unlikely will be universally adopted. At Berlin the discussions turned more upon precise questions of classification, especially those relating to the sedimentary rocks; upon the lines by which various groups of strata should be marked off; and, in some cases, upon the names by which these groups should be known. This change of procedure was necessitated by the progress made with the international geological map of Europe; the material for such discussion on classification having been provided in the shape of Reports from various national Committees, of which that from England, presented by Prof. Hughes, was by far the most complete.

At the London meeting the classification of the Cambrian and Silurian strata was fully discussed; and two other questions, only lightly touched upon before, were here

considered in some detail—the nature and origin of the crystalline schists, and the upper limit of the Tertiary system.

In Bologna numerous votes were taken, in Berlin several, but in London none. The English geologists were in a majority sufficiently large to carry any point upon which they were fairly well agreed, but no attempt was made to test this; and Prof. de Lapparent, in presenting a Report from the Committee appointed by the Council to consider the question of voting, paid a generous tribute to the English members for their self-restraint. There can be no doubt that the adoption of this Report marks an important epoch in the history of the Congress, and that resolutions hereafter voted will carry more weight than those which at present stand on its records. It recommended that members of the country in which the Congress meets should vote separately from the foreign geologists: if the votes of the two groups agree, the question will be taken as settled; if they disagree, the further consideration of the question will be postponed. The resolution further recommended that votes should not be taken on questions which are purely theoretical—such questions to be simply discussed, and various views obtained; and that decisions of the Congress should only refer to the more practical questions.

Two Commissions of the Congress have existed since the Bologna meeting—that on the Map of Europe, and that on Nomenclature and Classification. The work of the former is plainly marked out, and much has yet to be done. The other Commission has, however, in many respects served its purpose; it has obtained Reports from the various national Committees, most of which have been ably summarized by Prof. Dewalque. The future work of the Congress will partly lie in discussing these Reports, and in deciding such questions in general classification as may apply to wide districts, leaving minor points to be worked out by each country for itself. A Commission was therefore appointed with altered and somewhat wider powers; its functions will more fully shape themselves at the Congress in Philadelphia. As the future progress of the Geological Congress lies so much in the hands of this Commission, it may be desirable to record here the names of its members, which are to some extent the same as those already given (p. 519) for the Council of the London meeting, but there are some additions and changes:—Germany, Zittel; Australia, Liversidge; Austria, Neumayr; Belgium, Dewalque; Bulgaria, Zlatoski; Canada, R. Bell; Denmark, Johnstrup; Spain, Vilanova; United States, Hall; France, de Lapparent; Great Britain, Hughes; Hungary, Szabó; India, Blanford; Italy, Capellini; Mexico, Castillo; Norway, Kjerulf; Netherlands, Calker; Portugal, Delgado; Argentine Republic, Brackenbusch; Roumania, Stefanescu; Russia, Inostranzeff; Sweden, Torell; Switzerland, Renevier. Prof. Capellini was elected President of the Commission; and Prof. Dewalque, Secretary.

The Report upon the Map of Europe was presented to the Congress by Dr. W. Hauchecorne. This stated the progress which is being made. Four or five sheets of Central Europe will be ready for publication during the next two years, and it has been decided to publish the sheets as completed, each with its own title and index, instead of waiting for the completion of the whole of Europe, as was at first intended. A proof sheet (C iv.), containing a large part of Northern Germany, was exhibited; on this there are twenty-four different tints for the sedimentary formations, three for the Archæan, and nine for the eruptive rocks. The map is on the scale of 1 : 1,500,000, and will consist of forty-nine sheets. One colour is taken for each great group—Cretaceous, green; Jurassic, blue; &c. The subdivisions are shown by various modifications of these colours. As a rule, the lower subdivisions are shown by the darker tints, so that the map may be read with more facility than is usually the case with geo-

¹ Continued from p. 526.

logical maps. The map of the British Isles was handed in for publication at the closing meeting. Very little time was given to the map in the public sessions of the Congress, but the Map Commission had three long sittings, the results of which will be printed in the official Report. The most important points arrived at were the adoption of the term *Pleistocene* for the index of the map (the German term "*quartär*" to be bracketed with this); the separation of the modern deposits from the Pleistocene, and the mapping of the latter wherever practicable, the underlying formations (where known) to be distinguished by coloured lines; in modern eruptive rocks (those of volcanoes now active or only recently extinct) the stratified volcanic tuffs are to be distinguished from the cinders and the scoriæ.

M. Karpinski has been the representative of Russia on the Map Commission. On this occasion he was not present, his place being taken by M. M. Nikitin and Tschernicheff. The latter submitted an important note on the crystalline schists of the Ural Mountains, which would have enlivened the discussion upon this question in the public meetings of the Congress. He states that the crystalline schists of the Urals contain limestones with a distinct hercynian fauna, and also that the schists pass horizontally into Devonian strata. It is probable that in cases of this kind (and similar cases elsewhere were referred to in the public discussion) the schists will be represented by the colour denoting their presumed age, whilst their present lithological character will be denoted by coloured lines. M. Nikitin raised a point which is important in many parts of Europe, but which is especially so in Russia—that is, the necessity of distinguishing *transition-beds*. He instanced the Volgian beds, which link the Jurassic with the Cretaceous; the Tartarian, between the Permian and the Trias; and others, spoken of by M. Nikitin as Permo-Carboniferous, which link the Permian to the Carboniferous. These transition-beds occupy immense areas in Russia, and cannot well be fitted into the existing classification.

The discussion on the crystalline schists occupied the whole of the sitting on Wednesday, and part of that on Friday. The material for this discussion had been provided by a collection of papers printed in advance and distributed at the opening. Translations from parts of this polyglot pamphlet have now appeared in *NATURE*. Essays in English were also contributed by five officers of the United States Geological Survey, with an introduction by Major Powell; and by Mr. Lawson, of the Geological Survey of Canada. One by Reusch, on Norway, also in English, was received too late for printing in the pamphlet, but it will appear in the full Report of the Congress.

This discussion derived additional value from the fine collection of rocks, maps, lectures, &c., illustrating this particular subject close at hand in the temporary Museum. The Geological Survey exhibited a large collection of rocks, maps, sections, &c., illustrating the North-West, the Central, and the Southern Highlands of Scotland; important collections of British rocks were also exhibited by Bonney, Blake, Hicks, Callaway, Cole, Hatch, Rutley, Wunsch, and others; foreign rocks were exhibited by Bell from Canada, Delgado from Portugal, Torell from Sweden, Reusch from Norway, Giordano and Mattiolo from Italy; whilst maps, drawings, models, &c., illustrating the discussion, were exhibited by Teall, Baltzer, Cadell, Ricketts, Lapworth, and others. Special mention should be made of the splendid collection exhibited by Heim, illustrating the deformation, crushing, &c., which the rocks of the Alps have undergone. All these exhibits are described in the Catalogue (54 pages with supplement of 4 pages). Several members of the Congress assisted in the arrangement of this Museum, but its success was chiefly due to the labours of Dr. Hinde, Mr. Teall, and Mr. Rudler.

In the foregoing notes we have not attempted to summarize the discussions. These were reported at

some length in the *Times* and in other papers. We have preferred to devote the space at our disposal to a general survey of the meeting, and to note some points of importance which could not well be included in a formal report of daily proceedings. As already stated, the discussions may by some be held to have led to no definite result, inasmuch as no vote was taken and therefore no formal decision of the Congress can in future be appealed to. But the great value of such meetings lies in the opportunity afforded for personal discussion and the interchange of opinions, not only in the public sessions, but in the more easy and informal conversations over the exhibits in the Museum, in the corridors and reading-room, and at the friendly and social gatherings which made so pleasant a feature of the London meeting. We have no doubt that the general result of this meeting on geological opinion and progress will be at least as good as that of any which has gone before.

The London Congress was particularly fortunate in its place of meeting. Within the walls of the University of London there was ample accommodation for all the requirements of the Congress, whilst close at hand were the Jermyn Street Museum and the rooms of the Geological Society. Unfortunately the Honorary President, Prof. Huxley, was kept away by ill-health; Prof. Hughes, who has done so much for the Congress in England, was also unable to attend. The early death of M. Fontannes, who has so ably reported the proceedings of previous meetings, is a great loss to the Congress, and many fears were expressed that his place could not be adequately filled; but the labours of Messrs. Hulke and Foster in the Council, and of Barrois and Renard at the meetings, resulted in fuller reports than have appeared of any previous Congress.

REMARKS ON SOME OF THE MORE RECENT PUBLICATIONS DEALING WITH THE CRYSTALLINE SCHISTS.¹

IN acceding to the invitation of the Geological Congress to contribute to the discussion of the crystalline schists, the author expresses his regret that his time has not allowed him to throw new light by fresh observation on the points of controversy. Other labours have for a long time completely occupied him; so that he has only been able to occasionally assist with advice a younger fellow-worker, Herr Emil Danzig, of Rochlitz, in his researches on the Saxon granulites. This work, which has but recently been brought to a close, and has been placed at the disposition of the members of the Congress, is recommended to the notice of those fellow-workers who are interested in these matters, for in it the granulite question has been completely treated and advanced another stage.

Prof. Lehmann still takes his stand on the results furnished him four years ago by his investigations on the old crystalline schists.

The, on the whole, favourable reception of those investigations assuredly indicates that the right path has been struck, and that an extension of our views on the crystalline schists has resulted from them. This is also proved by the fact that these views have also been successfully applied in other places. That in many cases the opinions advocated by the author have not been rendered quite correctly, cannot excite surprise. Such misconceptions were scarcely to be avoided.

Prof. Lehmann strenuously opposes the notion that his generalizations were made without due consideration, and draws attention to certain criticisms to which his work has been recently subjected.

As is well known, the controversy on the Saxon granulites turns on the question, whether their plainly developed parallel structure is to be regarded as true bedding in the sense of sedimentary deposition, or as of eruptive or plutonic origin. The same questions arise in the discussion of all other districts in which crystalline schists occur; the solution, however, will by no means always be the same. It is beyond doubt that a whole

¹ "Bemerkungen zu einigen neueren Arbeiten über Krystallinschieferige Gesteine," by Prof. J. Lehmann. Published by the International Geological Congress, London, 1883. (Abstracted from the German by Dr. F. H. Hatch.)