surface was carried down through the gorge to be added to the old delta of the river. At last the major part of the Miocene rocks that partly occupied the plain were worn away and the plain has been reduced to its present temporary level; while the terraced hills on either bank still remain to attest the amount of watery degradation that the area has undergone.

So much for the scooping out of the valley. But there is another point which I would like to impress upon you. On each side of the Rhine there are important tributary rivers. Thus, for example, above the gorge we have the Maine, the Neckar, the Kinzig, the Elz, and other streams, flowing through deep steep-sided valleys; and these rivers have from a very early period been tributaries of the Rhine. It follows, then, that when the level of the Rhine was 400 or 500 ft. higher than at present the levels of the bottoms of these rivers must also have been 400 or 500 ft. higher than at present; and therefore, just in proportion as the great valley of the plain of the Rhine was being cut down and lowered, so in proportion must the valleys in which these rivers run have gradually been deepened. When we come to the gorge the same kind of argument applies to the Moselle and other tributaries of the Rhine.

I have elsewhere attempted to show that at one time the Moselle ran as high as the top of the table-land that now bounds it on each side. Everyone who knows that river is aware that, though it looks so hilly when we go up the stream in a steamboat, as soon as we reach the edges of the slopes on either side we are on the top of a great table-land intersected by numerous valleys, so that before the gorge of the Rhine was formed the Moselle ran at as high a level as the ancient Rhine; and just as the gorge of the Rhine was being deepened, so the Moselle was by degrees also enabled to deepen its channel. The same was the case with other rivers, right and left of the Rhine; and by applying this principle to the other great rivers of Europe we may hope in the long run to explain the physical history of all the systems of drainage of all parts of the continent.

One other point remains to be stated with regard to the physical history of the Rhine. Geologists well know that in older times the glaciers of Switzerland were on an immensely larger scale than at present. Large as they appear to us at the present day, they are of pigmy size when compared with their magnitude at a comparatively late period of the world's history. The Rhone glacier then spread across all the area now occupied by the Lake of Geneva, till it abutted on the Jura; and the old Rhine glacier extended all over the Lake of Constance, and reached at least half way from Schaffhaussen to Basle. The body of water which flowed directly from such glaciers must have been very great, and enormous must the moraines have been that were shed from the ice-sheets. From an examination of the pebbles that form the superficial gravel on the present plain of the Rhine below Basle, it is certain that a large portion of them have come from the Alpine regions. Such a great moraine as was shed from the western edge of the old glacier of the Rhine was constantly being attacked by the waters that flowed from its end, and thus by degrees pebbles were carried onward into the plain. The result is that a large part of the gravels of the Rhine is simply the waste of old moraines shed from the glaciers of Switzerland, added to by material carried down by the streams of the Vosges and the Schwartzwald, also partly derived from the moraines of ancient glaciers on a smaller scale.

Last year it was my lot to deliver here a lecture on the history of old continents, and I attempted to show that one old continent in particular retained its identity through a very long period of geological time; that from the close of the Upper Silurian period, all through the Old Red Sandstone and Carboniferous periods, through the Permian and New Red Sandstone epochs, over great part of what is now Europe, that continent, with many physical changes, still retained its identity. Such a vast continent remaining through all those geological periods implies a succession of epochs of time, which, as far as years and cycles of years are concerned, the mind has as yet only hints of data which some day may help us to grapple with such a problem, and not till astronomy comes more boldly to the help of geology, may we begin to hope for the solving of the problem of the actual value of geological time. However that may turn out, it is certain that during the long continental epoch alluded to there were, over and over again, many changes in physical geography far greater than that petty change which I have been endeavouring to sketch out to-night. The floras and faunas of the world in that old time changed, not in the minor degree I have been speaking of to-night, but were more completely remodelled again and again in great part, even generically. Mountain ranges rose, glacial periods intervened and passed away. Great lakes, sometimes fresh, sometimes salt, appeared and were obliterated by great terrestrial changes. At one time vast lakes, like those of the heart of Africa and North America, covered prodigious areas of land; at another, equal or larger areas were covered by salt lakes as large as the Caspian and the Sea of Aral. And when you think of the continental episode in the modern geological history of Europe to which I have drawn attention, you will see how small it really is, though it may look large to our minds, compared to the old continental epoch of which I spoke last year. This you may depend upon, that though to the superficial eye it may seem as if the world had always been going on just as it is doing now, and that through all time to come it will go on just the same, with its mountains, valleys, rivers, lakes, and seas, yet it is none the less certain that changes, such as I have described to-night, are but the forerunners of other mutations as great, aye, and far greater, that will take place in the future. Just as there is as yet no certainly measured limit to the geological time of the past, so also we know of no measurable limit to geological time to come. But why should I keep you with words such as these, when I may convey a whole chapter in physical geology, condensed into eight lines, by the greatest of our living poets:—

> There rolls the deep where grew the tree.
> O Earth, what changes hast thou seen!
> There, where the long street roars, hath been
> The stillness of the central sea.
>
> The hills are shadows, and they flow
> From form to form, and nothing stands:
> They melt like mist, the solid lands,
> Like clouds they shape themselves and go.

SCIENTIFIC SERIALS

In the *Journal of Botany* for March, the editor, Dr. Trimen, commences a series of useful articles (which is continued in the April number) on the Botanical Bibliography of the British Counties, being a list of country and district floras arranged topographically. The other paper of greatest interest in this number is one of a kind of which this very useful journal has now published a considerable number, and which may ultimately throw considerable light on some of the problems connected with the distribution of plants, On the Flora of the Leeds and Bradford District, by J. A. Lees.—The number for April commences with an article of some importance in systematic botany, A Revision of the genera *Dryobalanops* and *Dipterocarpus*, by Prof. Thiselton-Dyer, in which a number of new species are described, including two belonging to the previously monotypic genus *Dryobalanops*, and illustrated by a plate (two more being promised in the next number). The editor also gives in this number one of the most valuable specialities of the journal, his list of New Species of Phanerogamous Plants in periodicals published in Great Britain during 1873.

The *Scottish Naturalist* for April publishes a number of papers on almost every branch of Botany and Zoology, including one on Geology, of more or less interest to Scottish naturalists.—Mr. J. A. Harvie Brown proposes the establishment of a Natural History Publication Society, something on the model of the original plan of the Ray Society, for the purpose of publishing original papers on Natural History, principally on Mammalia and Aves, and for reprinting in fac-simile rare and useful tracts, pamphlets, &c., on the like subjects.—We have also further instalments of the lists of the Lepidoptera and Coleoptera of Scotland, by Dr. Buchanan White and Dr. D. Sharpe. This quarterly magazine seems to fill a most useful place in forming a channel of intercommunication between naturalists north of the Tweed.

Memorie della Soc. degli Spectroscopisti Italiani, December. This number contains a paper be G. Lorengoni, On the Observation of a partial eclipse of the sun in May last, observed by the spectroscopic and direct view methods. He discusses at length the advantages and accuracy of each method, and concludes that the former method is the best of the two.—G. de Lisa gives a table of spots on the sun, observed at Palermo in December, giving a mean of about eight spots each day.

The January number contains a note that a new Spectroscopic Station has been established at Turin, and an equatorial by Fraunhofer has been erected there.—Prof. Draper contributes a

paper on his beautiful diffraction of spectrum photographs, similar to the account of the same in NATURE some weeks ago.

Astronomische Nachrichten, No. 1,978.—M. M. Henry gives the elements of planet (126) Velléda, epoch 1874, January, 0·0 Greenwich M.T.

$$\begin{aligned} \text{Mo} &= 149^\circ\ 55'\ 51''\cdot1 \\ \Pi &= 347^\circ\ 49'\ 11''\cdot3 \\ \Omega &= 23^\circ\ 10'\cdot12''\cdot8 \\ i &= 2^\circ\ 56'\ 10''\cdot6 \\ \phi &= 6^\circ\ 5'\ 31''\cdot4 \\ \mu &= 930''\cdot9792 \\ \log.\ a &= 0\cdot3873777 \end{aligned}$$

Leopold Schulshof gives the following elements of the comet discovered by Winnecke in February last :—

$$\begin{aligned} T &= 1874, \text{ March, } 9\cdot95342 \text{ Greenwich Time} \\ \Pi &= 300^\circ\ 36'\ 42'' \\ \Omega &= 31^\circ\ 31'\ 18''\cdot2 \\ i &= 58^\circ\ 17'\ 14''\cdot5 \\ \log.\ q &= 8\cdot642852 \end{aligned}$$

The star in Perseus RA $2^h\ 13^m\ 56^s$ Dec. + 58° 1′ 53″·5 has been observed by A. Krüger to have varied from 8·5 mag. to 10 mag. in November 1872, and to have increased to 8·5 again in January last.

SOCIETIES AND ACADEMIES

LONDON

Geological Society, March 25.—John Evans, F.R.S., president, in the chair.—The following communications were read :—On the Upper Coal-Formation of Eastern Nova Scotia and Prince Edward Island, in its relation to the Permian, by Principal Dawson, F.R.S. The author described the Carboniferous district of Pictou county as showing the whole thickness of the Carboniferous system arranged in three synclinals, the easternmost consisting of the Lower series up to the Middle Coal-formation, and including all the known workable Coal-measures in the district—the second towards the west of the middle and the lower part of the Upper Coal-formation—and the third showing in its centre the newest beds of the latter. On the north the bounding anticlinal of the first depression brings up the New-Glasgow Conglomerate, which contains boulders 3 ft. in diameter, often belonging to Lower Carboniferous rocks, and represents the upper part of the Millstone-grit or the lower part of the Middle Coal-formation. The author regards this as representing an immense bar or beach, which protected the swamps in which the Pictou main coal was formed. The succession of the deposits above the Conglomerate was described in some detail as seen in natural sections. The Upper Coal-formation, as shown in the section west of Carribou Harbour, consists of—(1) Red and grey shales, and grey, red, and brown sandstones ; and (2) Shales, generally of a deep red colour, alternating with grey, red, and brown sandstones, the red beds becoming more prevalent in the upper part of the section. In Prince Edward Island beds apparently corresponding to these are found, and also gradually become more red in ascending. These are overlain, apparently conformably, by the Trias. The author gave a tabular list of 47 species of plants found in the Upper Coal-formation of Nova Scotia and Prince Edward Island, and stated that all but about ten of these occur also in the Middle Coal-formation. The number of species decreases rapidly towards the upper part of the formation ; and this is especially the case in Prince Edward Island, some of the beds in which are considered by the author to be newer than any of those in Nova Scotia. The plants contained in the upper deposits were compared with those of the European Permian, and a correlation was shown to exist between them, so that it becomes a question whether this series was not synchronous with the lower part of the Permian of Europe, although in this district there is no stratigraphical break to establish a boundary between Carboniferous and Permian. The author therefore proposes to name these beds Permo-Carboniferous, and regards them as to some extent bridging over the gap which in Eastern America separates the Carboniferous from the Trias.—Note on the Carboniferous Conglomerates of the Eastern Part of the Basin of the Eden, by J. G. Goodchild.—An Account of a Well-Section in the Chalk at the north end of Driffield, East Yorkshire, by R. Mortimer.—On Slickensides, or Rock-Striations, particularly those of the Chalk, by Dr. Ogier Ward.

Royal Horticultural Society, April 1.—Scientific Committee.—Dr. Hooker, C.B., Pres. R.S., in the chair.—Prof. Thiselton Dyer exhibited seeds of the plant called in gardens *Theophrasta imperialis*, sent from Rio Janeiro by Dr. Glaziou. From the evidence now forthcoming it appears that the plant belongs to a different family, *Sapotaceæ*.—Dr. Hooker showed a photograph from Mr. Russell, of Falkirk, of a fruiting specimen of *Encephalartos villosus*, sometimes called in gardens *Zamia Mackenii*. The plant is a native of Natal, and a similar species has been discovered on the Niger by Barter, and a third in Zanzibar, by Kirk. A plant discovered by Schweinfurth in Central Africa is probably the same as that mentioned by Kirk.—Dr. Masters presented a classified list with notes of species of Passiflora and Tacsonia cultivated in European gardens.—Mr. Renny made some observations on the drawing, by Montagne, of *Artotrogus*, exhibited at the last meeting, which together with the original specimens, Mr. Berkeley had been kind enough to allow him to examine leisurely. He was able to clear up a mistake which De Bary seems to have fallen into in his description of *Peronospora infestans* (Ann. des Sc. Nat., 4e sér., t. xx. p. 105, 1863). De Bary had not met with the resting spore of that species, but suggested that Montagne's *Artotrogus hydnocarpus* might be the desired organ ; but he had doubts on the point, as Montagne had written to him that he found it also on Turnip. The facts are, that Mr. Broome found a mould on decaying Turnip, which he sent to Montagne, who pronounced it to be a species of his genus *Artotrogus*, though he does not appear at any time to have supplied a specific name. He doubtless announced to De Bary that *Artotrogus* was to be met with on Turnip, and it was De Bary's assumption that *A. hydnocarpus*, the only published species, was the one spoken of. De Bary, having a confident belief that the various species of *Peronospora* are parasitic each only on the plants of one genus, or at most of one family, seems to have been thus led to the doubt he has expressed.

General Meeting.—H. Little in the chair.—Prof. Thiselton Dyer commented on the interesting plants exhibited. Amongst these were the two forms of *Primula verticillata*, one from Sinai the other from Abyssinia ; *Boronia megastigma*, a new Australian plant with a very agreeable smell ; the stem and foliage of the splendid Bamboo *Dendrocalamus giganteus*, in cultivation at Sion House ; and cut blooms of *Sterculia nobilis* from the same collection.

Entomological Society, April 6.—Sir Sidney S. Saunders, president, in the chair.—Mr. Frederick Smith made some interesting observations relative to the habits of the bee-parasites belonging to the genus *Stylops*.—Major Parry communicated a paper entitled Further Descriptions of Lucanoid Coleoptera ; and Mr. Smith read descriptions of the *Tenthredinidæ* and *Ichneumonidæ* of Japan, from the collections of Mr. George Lewis.—Further notes were read from Mr. Gooch, of Natal, respecting the destruction of the coffee plantations there, by Longicorn Beetles.

Royal Astronomical Society, April 10.—Prof. Adams, president, in the chair.—Mr. De la Rue gave a verbal description of a piece of apparatus which he had devised for carrying out M. Janssen's method of photographing Venus near to ingress and egress upon the sun's disc. The instrument is intended to be attached to the photo-heliographs and weighs less than 11 lbs., inclusive of a small driving clock, which carries a revolving plate of about 10 in. in diameter, on which small photographs of Venus and the sun's limb are to be taken in rapid succession. Lord Lindsay also described the form of instrument which he had devised for the same purpose ; it appeared to be very similar to that described by Mr. De la Rue, except that it is mounted on a separate pillar from the telescope in order to avoid tremors.—Lord Lindsay also read a paper On a Method of Determining the Solar Parallax, from observations to be made at the next opposition of Juno, which occurs in November of this year. He proposes, while in the Mauritius, to make a series of heliometric measures of the distance of Juno from the nearest fixed stars ; and by comparisons of the measures taken soon after Juno has risen above the eastern horizon with those taken before it sets at the western to determine the terrestrial parallax. By this method he will be able to make his measures during all the clear nights of the month or six weeks before and after opposition. And although the parallax will be considerably less than in the case of Venus, he considered that he had reason to hope that the probable error of the result would, owing to the number of the