In conclusion, may I venture to hope that before long some rules respecting stratigraphical nomenclature may be promulgated which may regulate in some way the issue of new names. It will surprise some of your readers when I say that I have lying before me a list of more than four thousand stratigraphical names.

NOTICES OF MEMOIRS.

I.—THE TROPICAL FORESTS OF HAMPSHIRE: BEING THE SUBSTANCE OF A LECTURE DELIVERED IN CONNEXION WITH THE LOAN COLLECTION, SOUTH KENSINGTON, by J. S. GARDNER, F.G.S., Saturday, Dec. 2nd, 1876.

"ENGLAND at the present time has a climate far from tropical, but the time to which I refer was when the palm and spice-plants flourished here, and when the climate may rightly be spoken of as tropical, not in a poetical or metaphorical sense, but actually. The data on which our inferences are based are the fossil leaves which we find in the clays of the south of Hampshire. Out of the many thousands obtained during many years, I have selected some which have been exhibited in the Loan Collection. Some have also been brought in illustration of our subject to-night. Collections of leaves from this spot and from Alum Bay have also been made by Mr. W. S. Mitchell, M.A., and others, and are now preserved in the British Museum.

It is the district immediately along the line east and west of Bournemouth which I have specially examined. The beds which occupy this area are of the age of the Lower Bagshot. Above the Bagshot series we have the Bracklesham beds full of marine forms; the Barton beds, also full of marine forms, but telling a tale of a different sea; the Headon, Bembridge, and Hempstead series, with many repetitions of marine and fresh-water conditions, indicative of long lapses of time. There is, too, the whole Miocene period, of which we have no trace in this district, but which we believe from continental evidences was of vast duration. Then, too, there followed periods of immense length, during which England underwent its latest Glacial epoch; after that the time during which the River Valley gravels and Brick-earths were formed. While, therefore, we speak of these beds as almost the youngest of the geological series, they really belong, when measured in years, to periods of an incalculably remote past."

With the help of diagrams and pictures Mr. Gardner traced the series of beds from Corfe to Wareham, Poole, and Studland, and then back from Studland to the mouth of Poole Harbour, and along the shore past Branksome to Bournemouth, and on to Hengistbury Head, the physical features and general appearance of the country being described. The alternations of clays, sands, and pebble beds, as they appear in the cliffs, and the pipe-clay diggings, were especially referred to, and Mr. Gardner then continued:—"No order of arrangement is at first apparent in these beds, but by traversing the sections many times and studying

them attentively there is, it seems to me, a very well marked and recognizable sequence. I will now indicate the sequence. It has never been laid before the geological public until now, and it is possible, as is often the case with new work, that there may be some objections raised to it. I can only tell you, however, that after discussing the matter with geological friends, my own convictions are strengthened." The author then referred to his diagram of the district. "This lower fresh-water series is seen in the neighbourhood of Corfe, and forms part of the cliffs at Studland. It is characterized by abundance of pipe-clays, and forms a thickness of possibly 200 feet. The middle fresh-water series, also met with near Corfe and at Studland, forms the whole thickness of the cliffs between Poole Harbour and Bournemouth. We thus have a magnificent section four miles long and 100 feet in height. Branksea Island is also formed of this series. Their entire thickness cannot yet be accurately estimated, but may be put down at some 300 feet. They are characterized by the fact that the clays contained in them are usually brick-earth.

The next series above is a marine series, and is some 400 ft. or 500 ft. thick. The base beds are dark sands and clays, succeeded by pebble beds and sands, then more sandy clays with pebbles, and ending with a thick deposit of white sands. This marine portion of the series occupies the cliffs between Boscombe and High Cliff. It is the middle fresh-water series which is so rich in the clay beds containing fossil leaves. These leaves are found in various conditions of preservation. In most cases the impression only of the leaves in the clay is met with, but in some cases they are so well preserved that the actual substance has been retained, although chemical changes have altered its composition, and it will peel off and blow away. In some of the clays the masses of leaves are so decayed that they cannot be recognized, and are not worth our collecting. Where the preservation is good, we can readily distinguish the various original textures of the leaves by comparing their general aspect and colour both among themselves and with existing forms. For instance, those which are thick, such as evergreens; thin, as convolvulus; hard, such as oak; or soft, such as lilac; or even velvety, such as the common *Phlox*, can all be recognized. Their colours, in most of the beds, vary from buff to brown, and I need hardly tell you that in no case have we any of the green colouring of the leaves preserved. Whilst these various shades of dark buffs and browns are in many cases the result of chemical change that has taken place after the leaf was covered up, yet I believe that in many cases this change had occurred, at least partially, before the covering up, just as we saw a few weeks ago the changed colours of the fallen leaves of autumn. In the darker clays the remains are black and completely carbonized; where this is so, the finer venation is indistinct and the remains difficult to save, so that we may discard them unless the outline of the leaf is of unusual form. The darker browns, I take it, indicate hard and evergreen leaves; for instance, the laurel-like leaves are always of a deep colour, whilst both the thin

and the succulent leaves are always of light colour, as in the leaves which we suppose to be fig, some species of *Smilax*, etc. No other colours have been met with, with one remarkable exception: fragments of a reed-like plant are found of a deep violet, staining the surrounding clay mauve for a considerable distance." The shape, the venation, and character of the margin of the leaves being the points by which comparisons are made with the leaves of trees now existing, were described at some length, and the difficulties of successfully making the comparisons were referred to. Among others the following fossil forms were mentioned as having been determined with but little doubt. Feather and fan-palms, *Dryandra*, beech, maple, *Azalea*, laurel, elm, acacia, aroids, cactus, ferns, conifers, *Stenocarpus*, and plants of the pea tribe, together with many others. "This question may perhaps have presented itself to your minds—how is it possible that the tropical forms of which we have spoken, such as the palm, aroids, cactus, etc., could have grown alongside of the apparently temperate forms, such as the oak, elm, beech and others? Time does not allow that I should go at any length into the explanation of this; but I may just remind you that in the long geological record of the beds found in England, there are to the geologist unmistakable indications of many changes in climate. Further, astronomers, having calculated the path of the revolution of the earth in ages past, tell us that in recurring periods, each hemisphere, northern and southern, has been successively subject to repeated cyclical changes in temperature. There have been for the area which is now England many alternations of long periods of heat and cold. Whenever the area became warmer, the descendants of semi-tropical forms would gradually creep further and further north, whilst the descendants of cold-loving plants would retreat from the advancing temperature, *vice versâ*. Whenever the area became gradually colder, the heat-loving plants would, from one generation to another, retreat further and further south, whilst the cold-loving plants would return to the area from which their ancestors had been driven out. In each case there would be some lingering remnants of the retreating vegetation (though perhaps existing with diminished vigour) growing alongside of the earliest arrivals of the incoming vegetation.

Such is a possible explanation of our finding these plant-remains commingled together. It must, too, be borne in mind that it is not so much the mean temperature of a whole year which affects the possibility of plants growing in any locality, as the fact of what are the extremes of summer and winter temperature. For example, one place may have a mean winter temperature of 50°, and a summer one of 70°; whilst another place might have a mean winter temperature of 20° and a summer one of 100°, and yet both have a mean annual temperature of 60°.

In Cornwall the maiden-hair fern grows in sheltered localities, because the winter temperature never sinks to the point that would cause its destruction. Again, at that most charming spot in the west of Ireland, Glengariff, the *Arbutus* still forms an abundant

underwood; and the Irish 'Film-fern' (*Hymenophyllum unilaterale*) flourished in many favoured spots until quite recently, when the modern Eccles Hotel has retained tourists too long in the district, who have ruthlessly carried off, as reminiscences of a pleasant holiday, this which was one of the most attractive features to the botanist."

After mentioning that in the two lower fresh-water series there are no animal remains but what have been blown in, among them insect wings and the earliest known English feather, the lecturer went on to speak of the physical conditions under which he supposes the beds were formed. He said that he regarded a river flowing from west to east as having deposited all these beds in a valley of from seven to ten miles, which it had made, and showed a picture of the restoration of what he supposed the view was like. The foreground of the picture was made up of plants from Mrs. J. E. Gardner's conservatory, being the nearest known living representatives of the fossil plants.

A block opened before the audience proved fortunately a good one and crowded with leaves. Some experiments were made during the lecture showing that there is in the decomposed granite enough iron to account for the colours of the clay.

II.—Note sur un nouveau genre d'Entromostracé fossile provenant du terrain carbonifère des environs de Saint-Etienne (*Palæocypris Edwardsii*), par M. Charles Brongniart.

MANY traces of the former existence of Entomostraca are to be found in the different geological formations, their carapaces being often admirably preserved and exhibiting all their external markings, whilst every vestige of the animals themselves has been entirely removed. Much uncertainty, therefore, exists concerning the exact zoological affinities of these fossils, and Palæontologists have been obliged to base their classifications on the form and external ornamentation of the carapace. M. Ch. Brongniart has been enabled, however, by a rare good chance, to examine and describe the remains of some Ostracods from the Coal-measures of Saint-Etienne, in which not only the carapace, but also the more delicate appendages, such as the antennæ with their hairs, the feet, etc., have been preserved. These Entomostraca, which were found imbedded in the silex filling the interior of a *Cardiocarpus*, are closely allied to the recent genus *Cypris*, but at the same time, as they differ in several essential characteristics from that genus, the author proposes to designate them *Palæocypris Edwardsii*, after Prof. Milne-Edwards, and gives the following details of their structure:—

Palæocypris Edwardsii is only half a millimetre ($\frac{1}{50}$in. nearly) in length; the body, as in *Cypris*, is enclosed in a bivalve, oval test, laterally compressed. The valves are narrower in front than behind, and their surface is covered with granulations, whilst numerous very short and fine hairs are seen springing from the dorsal margin. The body, properly so called, does not occupy the whole of the interior of the carapace; in front it approaches the dorsal edge, and at the bottom it almost touches the (ventral) margin of the valves.

The anterior portion of the body is curved, and in this region is situated the eye, which is large, black, oblong, very prominent, and placed much lower than in *Cypris*. The upper antennæ, inserted immediately below the eye, are long, setigerous, and composed of five joints gradually diminishing in size. Each of these joints bears on its upper part a tolerably long bristle, the fifth, however, is furnished with two. The lower antennæ consist of six joints, of which the second, third, and fourth carry each a single bristle, whilst the sixth has a tuft of four.

Like all true *Cypridæ*, it possesses two pairs of feet. The first pair slender, composed of four joints and terminating in two curved *claws; the second stouter, and, like the first pair, made up of five joints, the last terminating in two long curved claws; but it is also* furnished with two well-developed bristles, which spring from the summit of the first joint.

The jaws are not so distinctly visible in this fossil genus as the previously described organs; but M. Brongniart has been able to distinguish in one individual a large mandible which is divided at its extremity into several teeth, each provided with some very fine, short hairs. Another individual exhibits a palpus of two joints, with a pencil of fourteen medium-sized bristles attached to the terminal one.

The post-abdominal ramus is short, stout, and broad at its extremity; in some specimens (probably the females) it bears seven jointed bristles of uniform length, but in others (the males?) it is not so large, and provided with only four short bristles, one of which is longer than the rest. At the posterior portion of the body of the former appear two large black oval bodies, united at their bases, which may be the ovaries.

The author carefully notes the differences existing between the structure of the organs as exhibited in *Palæocypris* and that of the corresponding organs in the recent genera of *Cypris*, *Cypridopsis*, *Notodromas*, and *Candona*, at the same time pointing out that the general similarity between them, as far as their organization is concerned, is the more interesting when the immense interval of time by which their periods of existence are separated is taken into consideration. B.B.W.

III.—Geological Notes on some parts of West Tropical Africa. By D. O. Leng. From the Rep. Imp. Geol. Instit. Vienna, June 30, 1876.

[Communicated by Count Marschall, C.M.G.S., etc.]

THE rocks along the Okande river are argillaceous slates, gneiss, and mica-schists with garnets, intermixed with subordinate bands of reddish-white quartz. The prevailing rock in the Ashkura region is a coarse-grained *granite*, containing reddish-white, and frequently large crystals of orthoclase, having bright cleavage-planes,—oligoclase in smaller crystals, white with distinct binary striation,—also biotite-mica in green or greenish-black plates, single or agglomerated into small nodules, and amphibole in single, rather large, black, tabular crystals. In several detached blocks the felspar

is almost entirely decomposed into kaolin. The laminæ or strata of the rocks, occasionally of enormous size, and frequently visible in the bed of the river, follow the direction of the West-African schistose group, striking N.—S., and dipping E., with a high angle. The hills on both sides of the Ogowe river do not exceed 300 or 400 meters in height, excepting some few isolated heights estimated at 600 to 700 meters. The plain of the Okande region lies between 150 and 200 meters above the sea-level. The hills and the plain are both covered by a yellow, ferruginous, unstratified *loam*, without traces of organic remains, but containing concretions of argillaceous hydroxyd of iron and layers of soft white marls.

Innumerable *erratic blocks* of granite are spread over the hills and the plains of the Okande region. They have been transported and deposited there by the waters of the Ogowe, which was far more extended during the Diluvial Period than at present. A number of *Lakes*, on both banks of the Ogowe, and only separated from it by a strip of ferruginous loam, are the remains of the former extension of this river.

The whole region between the estuary of the Gaboon and the delta of Kamma (N'comi) may be regarded as having been under water previous to the deposition of these loams. The waters, subsiding into the valleys, formed rivers, and the more or less marshy tracts of land were gradually covered with the present immense virgin forests, obstacles to the investigation of the interior and breeding-places of deleterious miasmata.

IV.—Notes on Shell-heaps on the Coast of Peru, South America. By Prof. C. Wiener. (From the Journ. Imper. Geograph. Soc. Vienna, 1876, pp. 486-9.)

[Communicated by Count Marschall, C.M.G.S., etc.]

OF these Shell-heaps, or "Sambaquis," some lie along the coast, others 18 to 20 miles inland. They consist of accumulations of either whole or broken shells of a *Venus*, a large *Ostrea* (now living in brackish water), and *Corbulæ*. Some of these mounds are 60 meters high, and 100 meters in diameter.

Those composed of fragments are marine beach-deposits, and mark the course of the ancient coast-line. These are generally several kilometers in length, and their height does not exceed 1½ meter. The gradual upheaval of the Peruvian Coast being an undoubted fact, the age of these natural accumulations must be admitted to stand in direct proportion to their distance from the present coast. In fact, two of those most remote from the shore are composed of a species of *Corbula* no longer living on that coast. Prof. Wiener concludes, from the results of his measurements, that about fifty years ago, the whole Ratone Valley was under water, and that it has risen half a meter during the last ten years. The "Sambaquis" have escaped atmospheric disintegration, both by a crust (occasionally in the large mounds 40 meters thick), due to the dissolving action of carbonic acid and ammonia in the rain-water, and by a luxuriant vegetation.

The "Sambaquis" with entire shells are undoubtedly Kitchen-middens, and the work of man. Prof. Wiener has examined a number of these "Sambaquis" or "Casquieiros," making vertical sections through them. Some show, amidst the heap of shells, black spots of irregular form, arising from charcoal, ashes, stones blackened by fire, etc.; there are also bones of fishes, portions of skeletons of birds (especially parrots), splintered human bones, and broken stone axes. These are evidently the remains of repasts, chiefly composed of shell-fish. The heap of refuse having reached a certain height, the uppermost shells were thrown downward, and new ones heaped up, till the whole came to a height too troublesome for the laziness of the natives, who then chose a new place for their repasts. In other "Casquieiros" the section shows horizontal layers of earth; consequently those who heaped them up must have lived above the remains of their repasts, or, at least, not amidst them.

A third class are real *burying-places* made of ferruginous soil. These contain decomposed, but entire, human skeletons, well-preserved weapons, and stone mortars of finest workmanship; thus indicating an advanced state of civilization, in which human remains had ceased to be an article of food, and had become an object of respect.

The relative age of the "Sambaquis" could perhaps be best stated by their topographical situation. All of them, natural or artificial, stood *originally along the sea-shore*, as people who did not take the trouble to do away with the remains of their repasts cannot be supposed to have daily transported a heavy load many miles inland, and this, under the rays of a tropical sun.

Generally the period of *chipped stone-implements* is considered more ancient than that of *polished* ones; the *reverse* must be admitted for this part of America. The materials of the second period are dioritic or basaltic, and thus far softer and requiring less perfect tools in shaping than the harder ones of the first period. Basaltic rocks, of schistose texture, abound along the coast. A grindstone and a file were found to be sufficient to work an axe out of them. Fragments of the coarse-grained granite, in which these basalts are imbedded, such as were washed out by the sea, served to give, by rubbing, the form of an axe to any basaltic fragment. It must be remarked that *polished* stone-weapons are exclusively found along the *coast*, and as excluisvely *chipped* ones in the *interior;* and that the inland natives are more advanced in civilization than those living along the coast.

REVIEWS.

I.—Geology for Students and General Readers. Part I. Physical Geology. By A. H. Green, M.A., F.G.S., Professor of Geology in the Yorkshire College of Science, Leeds. 8vo. pp. 552 and 143 woodcuts. (London: Daldy, Isbister & Co., 1876.)

IN the preface to his work Prof. Green remarks, that most geologists are now obliged to concentrate their attention on some