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SCIENCE-GOSSIP

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EDITED BY

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SCIENCE-GOSSIP.

A CELEBRATED OCEANOGRAPHIST.

By John T. Carrington.

IT falleth not to the lot of many men to have means available for equipping an ocean-going steamer to conduct thalassographic explorations at one's own expense. Such, however, was the subject of a recent paper read before the Royal Geographical Society of London by His Serene Highness the Prince of Monaco, whose success as an investigator of the mysteries of oceanography and marine biology are so well known.

His Serene Highness the Prince of Monaco.

Albert Honoré Charles Goyon-de-Matignon-Grimaldi, Prince of Monaco, was born at Paris, on November 13th, 1848, and succeeded to rule in 1889. The Grimaldi family, originally of Genoese extraction, have held what now constitutes the Principality of Monaco for upwards of nine hundred years. The line of sovereigns, though at present reigning over no more than some eight square miles of territory, is one of the longest in Europe. Considering the size of the State its revenues are immensely rich, and being wholly the private property of His Highness, the Prince is enabled to indulge in such an expensive study. The State is admirably managed, being most perfectly kept, whilst the inhabitants are free from any taxation. Situated in a sheltered bay, its salubrious climate enables the outdoor growth of numerous tropical palms and other plants that fruit abundantly. The eucalyptus grows there to full size, flowering and fruiting profusely, whilst many rare South European plants occur on the rocky crags overlooking the Mediterranean littoral. Being so picturesquely situated it is not surprising that almost every parcel of available land is occupied by gardens and fine houses. For the lover of nature there is still a considerable amount of broken ground for observation of botany and entomology.

Living in such a lovely place for much of each year of his life, it is not to be wondered that the Prince should have cultivated the study of nature. Nearly every summer for eight or ten years past he has made at least one voyage of oceanic exploration. His present vessel, the "Princess Alice," was built on the Thames especially for the purpose of scientific investigation of the floor of deep seas. It is fitted with laboratories, there being also accommodation for the scientific staff and artists employed. In this work the Prince forms an excellent example to the many rich men who content themselves with building magnificent vessels solely to win paltry prizes in yacht races, or to loiter more or less aimlessly on sunny seas.

ORIGIN OF ARCTIC PLANTS IN BRITAIN.

By G. W. Bulman, M.A., B.Sc.

AMONG the most interesting relics of the Glacial period are some rare Arctic plants widely dispersed on the higher mountains of Wales, the Lake district and Scotland. These are supposed to have come south with the ice, and when temperate conditions returned to have been left stranded on a few of the higher hills to become witnesses of the glacial conditions which led them from their northern home. Among them may be mentioned *Lloydia serotina*, of the mountains of North Wales; *Potentilla sibbaldia*, of the Scottish Alps; *Dryas octopetala*, of the limestone heights of Britain and Ireland; *Saxifraga nivalis*, of the mountains of the Lake district, Wales, the Highlands; and others. Certain of them occur again on the Swiss Alps and the Himalayas, but are absent from the intervening lower ground. They are found also in the Arctic regions, which is supposed to be their native home.

How was this Arctic flora able to migrate to Britain? There are two suppositions regarding glacial Britain. One is that it was a cluster of low-lying, ice-covered islands, formed by what are now the higher parts of the country; the other, that it was joined to the Continent by elevation and had a land connection with the Arctic regions. The latter gives the easier solution of the problem of the migration of these Arctic plants southwards; indeed, a land connection seems almost necessary to enable them to reach Britain. This was the opinion expressed by Prof. Forbes in his "Fauna and Flora of the British Islands," where he remarks, "I cannot but think that so complete a transmission of that flora as we find on the Scottish mountains was aided, perhaps mainly, by land to the north, now submerged" (1).

At the same time he held the view that glacial Britain was merely a group of islands in an Arctic sea. He continues: "Now it was during this (the Glacial) epoch . . . . . that Scotland and Wales and part of Ireland, then groups of islands in this ice-bound sea, received their Alpine flora and a small portion of their fauna. Plants of subarctic character then would flourish to the water's edge" (2).

He suggests "transportation on floating masses of ice." It is, perhaps, a little hazardous to offer an opinion as to whether plants could migrate across an ice-bound sea. Currents might carry the seeds across the intervening waters. Prof. Forbes' masses of ice might do something; but if the land to which they were being carried was covered with ice down to the water's edge it is difficult to see how they could effect a landing. It can, however, be supposed that seeds were drifted across before glaciation had proceeded so far as to present the barrier of an ice-bound coast.

That the forms common to Britain and the Arctic regions migrated southwards during the Glacial period is the usual explanation; but the alternative view, that they have migrated northwards from temperate regions, seems worthy of consideration. There is one fact in Arctic botany which favours this latter supposition. Out of the whole Arctic flora only one genus, *Pleuropogon* (with one species, *P. sabine*) and seven species of other genera are peculiar to the Arctic regions. The rest all occur in temperate climates. This suggests that the common forms migrated to rather than from the north.

Again, the present system of ocean currents renders more probable a transference of seeds of British plants to Arctic lands than of seeds of Arctic plants to Britain. The Gulf Stream passing along our western shores must at times receive vegetation drifted down our westward flowing rivers, and carry it on towards the North Pole. That this is possible is well illustrated by the recently recorded discovery of a drifted seed of the tropical *Ipomea tuberosa* in the Hebrides (3). It is also well known that by the agency of the Gulf Stream large quantities of drift wood are heaped up on the shores of Spitzbergen and other Arctic lands. The colder currents from the north passing beneath the Gulf Stream would not transfer Arctic species to Britain.

Apart from such considerations as these, the most natural explanation of the distribution of those plants confined to isolated summits of lofty mountains is the supposition that they have migrated from the Arctic regions. It is otherwise with certain widely distributed forms common to Arctic and temperate lands. Thus, *Armeria vulgaris*, occurring on hill-tops and mountains, is also distributed round our shores at the sea level as far south as Cornwall, and ascends some of our rivers. *Cochlearia groenlandica* has a similar distribution. *Taraxicum officinale*, another Arctic plant, is found everywhere. The distribution of these and many others is more easily explained on the supposition that temperate regions were their original home. Indeed, when we examine the actual distribution of the first-mentioned Arctic species, we find that it cannot entirely be explained by migration from Arctic lands during glaciation.

(1) Mem. Geol. Surv., i. p. 399.
(2) *Ibid.* p. 345.
(3) "Annals of Botany," vol. vi. p. 369.

Thus, for example, *Lloydia serotina* is found on the Alps and Himalayas besides the mountains of North Wales; and two questions arise: (*a*) Did glaciation extend over the district between the Himalayas and the Arctic regions? (*b*) Did it extend over that between the Alps and the Arctic regions? Probably no one will venture to answer the first question in the affirmative, for the latitude of the Himalayas is 30°, or that of North Africa; and the evidence that the Asiatic continent was glaciated even north of 60° has been questioned. It seems a more reasonable supposition that the common species were carried over the intervening lower ground by birds or other agencies, than that there was a Glacial period sufficiently intense to permit Arctic plants to live on the plains in lat. 30°. Nor is there evidence that glaciation extended over the area between the Arctic regions and the Alps. If it had been so, a considerable portion of northern France, of Austria, and of Russia down to the shores of the Black Sea, must have been glaciated, and for this there is no evidence.

What is here remarked of *Lloydia serotina* applies equally to the greater number of the supposed botanical relics of glacial conditions. Of course the fact that the Glacial period will not account for their existence on the Alps and Himalayas does not prevent it being the cause of their presence in Britain, yet it takes away from their value as independent evidence of glaciation, and suggests the possibility of another explanation. It is, therefore, worth while to inquire whether the occurrence of Arctic plants on our lofty mountains may not be accounted for independently of the Glacial period. A remarkable fact in botanical distribution, not confined to our Arctic plants, is, that similar or identical forms are wont to appear under similar conditions in widely separated and isolated areas. The possibilities of plant distribution are so great that it is not always necessary to bring in the supposition of similar conditions prevailing over the intervening tracts at some former period. Thus, certain marine plants occur round the brine lakes of Cheshire, but it has not been considered necessary to suppose Cheshire has had communication with the sea in recent times. Again, in the hot springs of the Azores, certain tropical forms of plant life are found, yet we do not assume an extension northwards of tropical conditions to account for their presence.

In connection with the plants we are considering, the agency of currents may be left out of consideration; for, although they might bring marine and lowland plants to our shores, they could hardly bring Alpine plants to our mountain summits. Bird migration is perhaps the only other means by which it could be accomplished, for this is doubtless a potent agency in promoting plant distribution. Every spring large numbers of birds leave temperate regions to breed in Arctic lands. Thence they return the succeeding autumn, and may occasionally or frequently bring, in the soil adhering to their feet, or in their feathers, seeds of Arctic plants. This, then, is possibly the origin of our Alpine flora. In a similar way British plants might be carried to Arctic lands.

A land connection with the north being held by many to be necessary to bring an Arctic flora to Britain, one with the continent of Europe is considered equally essential to bring back a temperate flora and fauna when the ice age had passed away, on the supposition that these plants had been driven out of the country or exterminated by the cold. The apparent necessity for a land connection by which temperate forms might return is one of the strongest arguments for such a connection. The possibility ought not to be lost sight of that a portion—perhaps a considerable portion—of our pre-glacial flora was *not* driven out of the country by glaciation. It must be remembered in what close proximity at the present day a temperate flora is found to glaciers in Switzerland, the Himalayas and North America; while in New Zealand glaciers even discharge their débris in the midst of a sub-tropical vegetation. If we suppose that the glaciers, or ice-sheet, extended so far south as the latitude of London, there would still be left an area sufficient to form an asylum for a remnant of the pre-glacial flora. The belief that the ice did extend so far is founded on the assumption that the boulder clay was formed beneath it. The balance of evidence, however, seems rather to indicate that a great part of the boulder clay was formed beyond the limits of the ice. Hence there appears to be some justification for the belief that some part, at least, of our pre-glacial vegetation was not driven out of the country or exterminated. The greater the number of possible survivals, the less the need of a post-glacial land connection with the Continent.

That little colony of southern plants, isolated from the rest of their kind, in the south-west corner of Ireland also presents an interesting problem in botanical distribution, and its solution is connected with the subject of glaciation. The species in question include *Saxifraga umbrosa*, *Erica mediterranea*, *Arbutus unedo*, *Pinguicula grandiflora*, and others, which are not found elsewhere in the British Islands, and whose nearest habitat in Europe is the North of Spain. When did these plants migrate to their present quarters? If they did so in post-glacial times, then it would appear that they did not cross England in the way in which the flora and fauna of Ireland is generally supposed to have reached that country; for in that case we should expect to find them still in the

warmer parts of England. The only other suggestion is a post-glacial land connection between Ireland and the North of Spain, for which there appears to be no independent evidence. It remains, then, to examine the possibility that they may have remained there during glaciation. Suppose that during the warm period which preceded glaciation, the above species were widely spread over Britain and Ireland. Then, as the cold increased and glaciation came on, they would be driven south, and the spot where they would be most likely to survive would be the south-west corner of Ireland, provided our shores were washed, as they are to-day, by the Gulf Stream during the Glacial period. There is evidence that such was the case, because: (*a*) palæontology indicates that a warmer climate prevailed on the western shores of Britain than on the eastern; (*b*) glaciation extended further south in North America than in Western Europe, as it does to-day. Prof. Forbes ("Fauna and Flora of the British Islands") has expressed the opinion that this peculiar flora migrated to Ireland before the Glacial period. If this is the true explanation, then we see the possibility that a considerable portion of our vegetation may have survived glaciation. There remains, however, the possibility that the flora of the south-west of Ireland may have reached its present station by aid of bird migration in post-glacial times.

Another botanical fact which has been generally explained as the result of the Glacial epoch, is the similarity and close relationship to northern forms of the plants inhabiting the higher, and consequently colder, regions round the equator. Thus, Thomson, the African traveller, in describing his ascent of Kilimanjaro, writes: "The occurrence of brambles, brackens, male and lady ferns, various spleenworts, maidenhair, and mountain polypody, would have made us imagine we were in Europe, but for the unusual profusion and rank luxuriance" (4). Mr. Wallace, in describing the flora of Mount Pangerango, in Java, writes: "At about 8,000 feet European forms of plants become abundant. Several species of honeysuckle, St. John's wort and guelder rose abound. . . . . A few of the smaller plants (*Plantago major* and *P. lanceolata*, *Sonchus oleraceus* and *Artemesia vulgaris*) are identical with European species" (5). A somewhat similar state of things occurs all round the equator. These temperate forms are supposed to have been driven towards the equator by the glaciation of the northern part of the hemisphere in which they originated. When temperate conditions returned, they are supposed to have ascended the mountains in search of a temperate climate. The remarkable resemblance between certain plants in far distant temperate regions, and on opposite sides of the equator, receives its explanation as the result of glaciation.

While the former can be explained as the result of glaciation on any theory, the latter is supposed to bear special witness to the truth of the astronomical theory. Thus, Sir Robert Ball claims the distribution of these plants as evidence of the truth of the theory of glaciation set forth in "The Cause of an Ice Age." The way in which the astronomically-produced glaciation enabled the plants to cross the equator is as follows: certain plants are natives of temperate regions in the northern hemisphere, and this hemisphere begins to undergo glaciation. These plants will be driven southwards by the cold. It is assumed that they will be driven as far south as equatorial regions. When the northern hemisphere becomes warmer again the plants will be forced to seek a more congenial climate by ascending equatorial mountains. This accounts for the band of temperate plants on the highlands round the equator. According to the astronomical theory, as the northern hemisphere grew warmer the southern grew colder, and finally became glaciated. It is assumed that the temperate flora of the mountains would then be able to descend to the equatorial plains south of the equator. They would remain in equatorial regions as long as glacial conditions continued in the southern hemisphere, but as these passed away the increasing warmth would drive them south until they reached southern latitudes as high as those northern ones from which they started.

The objection to this explanation is that it is only the temperature of one season of the tropical year which is reduced during glaciation on the astronomical theory; the other season becomes hotter. According to Sir R. Ball's data, the average winter temperature would be reduced 21° F., and this would give one season of the tropical year with a temperature perhaps equal to our summer. But as the temperature of the other season would be increased 42°, the tropics would be even less fit for the maintenance of temperate plant-life than they are to-day. In fact, it may be said without reserve that the maintenance of Arctic plant-life on the astronomical theory on the area between temperate regions and equatorial mountains during the long period of glaciation would be impossible. Mr. Clement Reid has concluded from geological evidence that during glaciation the temperature increased rapidly towards the south. Thus, while glacial Britain was 20° colder than it is to-day, the shores of the Mediterranean were only 5° below their present temperature. At this rate of progression, we can scarcely suppose equatorial lands would be any cooler at all.

Failing glaciation, however, bird migration may be suggested as at least a partial explanation of

(4) "Through Masai Land," p. 144.
(5) "Malay Archipelago," pp. 182-185.

equatorial botany. It has been pointed out, for example, that certain birds which spend the summer and breeding season in the Arctic regions traverse the whole of North America and cross the equator to spend a second summer in La Plata. The possibility of the transference of north temperate forms to south temperate latitudes by this means is obvious. A possible transport from Arctic to Antarctic lands is even suggested; for in Mr. Hudson's book, "The Naturalist in La Plata," to which I am indebted for the above fact, we find the interesting observation that certain birds of the same species as those which come from the Arctic come also to La Plata from the Antarctic regions. Thus possibly certain individuals actually pass from Arctic to Antarctic lands.

Again, if northern plants were driven southwards by the cold, and then made to ascend equatorial mountains by the returning warmth, northern animals should also have been compelled to do likewise. There seem, however, indications that this was not the case. At least, this is so with Kilimanjaro, whose flora, as we have seen, resembles that of Europe. Commenting recently on its mammalian fauna, Mr. P. Sclater writes: "In short, we find on Kilima-Njaro merely more or less modified representatives of the inhabitants of the surrounding districts. So far as this piece of evidence goes, the wave of boreal life, impelled by the Glacial period, did not, in Africa, advance so far south as the equator"(6). The evidence of certain individual species again, as indicating glaciation, is frequently overrated. This is so, for example, with *Betula nana*. As a general rule, the presence of *Betula nana* seems to be accepted as evidence of glaciation, yet it can scarcely be said to indicate necessarily Arctic conditions; it is not even exclusively an Alpine plant in Britain to-day. On the west coast of Scotland, in the neighbourhood of the mouth of the Clyde, this plant flourishes abundantly. Yet the climate of this district is exceptionally mild, perhaps not much less so than that of Devon. Further north, on the same coast, the tender fuchsia flourishes, and stands the winter. Similar remarks apply in a greater or less degree to other species.

The conclusion to which this examination of certain facts in botanical distribution leads is that they have been too hastily accepted as positive evidence of glaciation. Thus the rare Arctic plants of our higher summits may have reached their present position by other means, as they must have reached the Alps and Himalayas by other means, possibly carriage by birds. Such plants common to Britain and the Arctic regions as are widespread and abundant are more likely to have passed from the former to the latter.

As regards northern temperate plants, Sir R. Ball's glacial summer of about 120° F. would scarcely permit their migration to the foot of equatorial mountains. And if, as Mr. Clement Reid infers from geological evidence, the temperature of the Mediterranean region was only lowered 5°, we can scarcely suppose that the tropics were sufficiently cooled to permit the existence of temperate plants. Their presence on tropical mountains, then, can scarcely be explained as the result of glaciation, or taken as evidence of the astronomical theory.

Certain considerations indicate the possibility that many of our native plants were able to survive the Glacial epoch, and that our country did not necessarily require to be replenished by a land connection with the Continent.

Finally, the evidence of certain individual plants as indications of glaciation has been made of too much importance, since they occur now under climatal conditions which are very far from being glacial.

29, *Queen's Terrace, Jesmond, Newcastle-on-Tyne.*

(6) "Natural Science," April, 1893, p. 268.

THE NEW F.R.S.—The Council of the Royal Society has recommended its usual fifteen candidates for election this year. They are HENRY FREDERICK BAKER, M.A., Fellow and Lecturer of St. John's College, Cambridge, whose qualifications are mathematical; ERNEST WILLIAM BROWN, Professor in Haverford College, also a mathematician and student of celestial motion; ALEXANDER BUCHAN, M.A., LL.D., F.R.S.E., Secretary of the Scottish Meteorological Society from 1860; among other work he issued the "Challenger" Reports on Atmospheric Circulation, in 1889, and on Oceanic Circulation, in 1895; SIDNEY FREDERICK HARMER, M.A., Superintendent of the University Museum of Zoology and Fellow of King's College, Cambridge,—it will be remembered he is joint editor of the "Cambridge Natural History"; ARTHUR LISTER, F.L.S., Student of the Mycetozoa; Lieut.-General CHARLES ALEXANDER MCMAHON, President of the Geologists' Association and Vice-President of the Geological Society of London, student of petrology and geology; WILLIAM OSLER, M.D., F.R.C.P., Professor of Medicine in the Johns Hopkins University, Baltimore, a scientific physician; Hon. CHARLES ALGERNON PARSONS, M.A., inventor and engineer, inventor of the compound steam turbine for driving dynamos and marine vessels; THOMAS PRESTON, M.A., Professor of Natural Philosophy, University of Dublin, student of light and heat; EDWARD WAYMOUTH REID, M.B., B.A., Professor of Physiology, University College, Dundee, student of absorption and secretion and electromotive phenomena; ALEXANDER SCOTT, M.A., D.Sc., F.R.S.E., F.C.S., student of exact determination of atomic weights and of combining proportions of volume; ALBERT CHARLES SEWARD, M.A., F.G.S., University Lecturer in Botany, Cambridge; WILLIAM ASHWELL SHENSTONE, F.I.C., Science Master at Clifton College, successful science teacher; WILLIAM MARTYN TAYLOR, Barrister-at-Law, Fellow Trinity College, Cambridge, mathematician; JAMES WIMSHURST, Member of Consultative Staff, Board of Trade, improvements in influence machines.

LONDON SCIENCE MUSEUMS.

THE Select Committee appointed by Parliament to inquire into and report upon the administration and cost of the Museums of the Science and Art Department, issued another report at the beginning of May. The first was published in July, 1897, and a final one is still promised. The report before us deals with the South Kensington Museum, and the Geological Museum in Jermyn Street.

The Committee is "unanimously of opinion that with a view to present efficient management, to economy of administration, to future development of the collections, and to their full use for the purpose of exhibition and of instruction, it is necessary: (1) That the whole area on the east side of Exhibition Road (except that occupied by the Royal College of Science, and which cannot be sacrificed except at great cost), be exclusively devoted to the Art Museum and Art Library. (2) That provision for the whole of the Science Collection, the Science Library for Loans of Scientific Objects, and for the Science Schools, be made on the west side of Exhibition Road."

The Committee recommends that this concentration of art on one side of the road and of science on the other side is conducive to good administration, to satisfactory expenditure of the money voted, and general efficiency both in the museum and schools. The site to be devoted to the Science teaching Department seems utterly inadequate in view of the future. This is ably shown in the influentially signed protest printed in "Nature" of 19th May last.

The Committee further recommends, also unanimously, that the Geological Museum in Jermyn Street be no longer occupied, and that the collections at present contained in the building be removed to Exhibition Road, South Kensington, to be made part of the science collections.

No doubt it is most desirable that the science schools of South Kensington should have every possible facility for examining material of the best character available for their students. We must, however, earnestly protest against the latter recommendation of the Select Committee. The present tendency is to centralize everything of a scientific nature at South Kensington, and so, perhaps inadvertently, to foster professional science and the starvation of the amateur's opportunities. From many points of view South Kensington is admirably situated and could hardly be better for those who are only occupied in scientific work. To others, however, to whom collections for reference are equally important, this centralization at South Kensington makes them as unattainable as if they were deposited in one of the great Midland towns. To the busy man occupied in the City, at Charing Cross, and even at Westminster, a visit to South Kensington Museum is as rare an event as to many of his country cousins. Such an occasion means devoting a couple of hours or more during the busiest portion of the day, being that when the reference types at the museums are open. To many persons it is impossible to spend this time in comparing or identifying a specimen. What is really wanted is not the removal of the Jermyn Street Museum—one of the most useful in London—but others in more central positions, in different branches of natural science, with type collections. We would ask our very large circle of metropolitan readers, and those in the country who frequently visit London for a short time only, to say how often they visit the South Kensington Museums?

We are very pleased to find ourselves in such good company, in opinion, as with Professor W. Boyd Dawkins, who has entered a loud protest against the removal of the Museum of Practical Geology from Piccadilly. His letter appears in the "Times" of May 12th, and is of such importance we take the liberty of quoting it. Professor Boyd Dawkins says:

"The removal of the Jermyn Street Museum and Library to South Kensington, recommended in an interim report of the Select Committee, surely could only have been proposed as a *ballon d'essai* and without consideration of the interests involved. If it be carried out the museum will not only lose its unique character, but it will become comparatively useless to many busy men who have found it of the greatest service, and who cannot spare the time to journey to a distant suburb. Its present position, close to the scientific heart of London—Burlington House, the home of the learned societies, and within a few minutes' drive of the Institutions of Civil and Mechanical Engineers and of the Houses of Parliament—causes it to be largely used in matters relating to geology, mining and Civil Engineering. It would be worse than a mistake to uproot it and make it a mere unit in the fortuitous concourse of atoms known as the Science and Art Museum at South Kensington.

"It is at present the only repository in this country where the specimens and the literature generally relating to mining are brought together. It is also organically connected with the Geological Survey of Great Britain, just as the École des Mines in Paris is linked to the Geological Survey of France. It is admirably organized, and covers a section of human knowledge which has nothing to do with the Science and Art collections. To sink it in a great overgrown department that deals *de omnibus rebus et quibusdam aliis*, and that has not yet classified properly its own multifarious collections, would be an injury to material interests which ought not to be allowed by Parliament.

"The institution in its present place is doing good work. Why meddle with it? Instead of

being abolished it ought to be made more worthy of a nation possessing such mining interests as ours. It is difficult to believe that the committee can be aware of the mischief which would result from its removal, or of the extent to which the removal would be opposed. If technical education is to be encouraged our museums must be multiplied and made more accessible to the many instead of being diminished or concentrated in a suburb where they can only be a luxury of a few."

After all, the value of a museum depends on its use for practical purposes, and not as a show place for visitors. That use is largely controlled by accessibility. We contend with Professor Boyd Dawkins and many others of equal authority, that the removal of the Jermyn Street Museum from such a central and accessible point as Piccadilly Circus would be a grave mistake. It should be remembered that there is a large section of society, and that among the actual taxpayers who provide the funds for the Science Museums, who frequently find necessity to refer to them. In such cases one cannot trust with satisfaction a deputy, no matter how skilled. It should be remembered that the necessity of a museum for reference purposes does not end with the cramming of students for examination purposes. If that were so, nothing could be better than the centralization at South Kensington.

The annual vote for the Museum of Practical Geology, Jermyn Street, which is attached to the Geological Survey, is £3,966, a paltry amount in comparison with the annual grant of £74,307 for the Science and Art Department at South Kensington alone. The saving to be gained by the removal of the Geological Museum to Kensington would be so small that the cost of such removal would absorb the saving for some time to come. It would be a different matter if the Science and Art Department at South Kensington were illiberally treated by Parliament and was starved. Then there would be some excuse for securing a geological collection for teaching purposes, even by annexation. Such excuse does not exist, for out of the £74,000 a year spent by the Department at Kensington, a typical collection could, in time, be purchased. If such be impossible, let the students walk round the corner to the Natural History Museum in Cromwell Road, where is probably the finest geological collection in the world.

Rather than remove the museum from Jermyn Street, let the Government make it worthy, as Professor Dawkins says, of the important mineral resources of Britain.

JOHN T. CARRINGTON.

ORIGIN OF THE HUMBER MUD.

BY THOMAS SHEPPARD.*

IT is only too well known that there are enormous accumulations of mud and sand in the estuary of the Humber. The question as to where it all comes from is, therefore, only a natural one. The usual reply is, that it comes from the Rivers Ouse, Trent and Hull, but the more the subject is examined the more difficult it is to positively decide upon the original source of the particles of mud with which the Humber water is impregnated, and the more is one convinced that the mud does not all come from the rivers which drain into the Humber.

It will be admitted that the mud in the Humber is accumulating. A most notable example is at Reed's Island, between North and South Ferriby. Twenty-five or thirty years ago this was a comparatively small island, with a plot of grass in the centre on which a few cattle were reared. Now the island is hundreds of acres in extent and has an enormous number of cattle grazing upon it, and it is annually increasing in size. In the neighbourhood of Spurn and Sunk Island also, as in other parts of the Humber, new land is continually being formed, whilst the Humber Channel itself is almost choked with sand and mud banks. Taking all these facts into consideration, it seems hardly possible that the material brought down by the rivers is sufficient to account for the vast accumulations of sediment in the estuary and on its banks.

If the rivers Ouse, or Trent, or Hull, be examined at ebb tide, when the normal amount of water is flowing down, it will be seen that the waters are comparatively clear, and though a fairly large amount of material may be brought down from the higher reaches of the rivers in solution, very little appears to be coming down in suspension, and it is the latter material which mostly affects the question. It is a significant fact that when the tidal waters are flowing up stream, the water is much more muddy and coffee-coloured than when the waters of the rivers only are descending in their channels. Undoubtedly a large quantity of detritus is carried along by the rivers, but this is mostly derived from the high ground near their sources, and the bulk of it in all probability is filtered out amongst the herbage on the banks of the streams, or else goes towards building up the alluvial flats so characteristic of the Ouse and Trent.

*Paper read at a recent meeting of the Hull Scientific and Field Naturalists' Club.

These two rivers, but perhaps more especially the latter, are at times very muddy in their courses, especially when the water is flowing a little quicker than usual. The material which causes this is principally derived from one or other locality on the river banks, and is deposited further up or down the river, as the case may be, according to the tide. In this manner the mud is continually moving from one spot to another, though in the aggregate the result is very trifling, and no great amount reaches the Humber waters. The sediment that does reach the Humber by the rivers can only be a very small proportion of that which exists in the estuary; and as it apparently does not come down the rivers flowing into the Humber, it must come in from the sea. In order to ascertain whether this is likely or not, it must be ascertained what is going on outside the river.

The waters of the North Sea are continually washing particles of rock, sand and mud in a southerly direction, and slowly but surely the material on the Yorkshire coast is travelling southward. It never travels in a northerly direction. A good illustration of this can be found in the chalk boulders around Flamborough headland. As is well known, the beach around that promontory is strewn with masses of chalk of all sizes which have been dislodged from the cliffs. These can be seen in plenty in Bridlington Bay and further south, though naturally getting less plentiful as they get towards the Humber. Practically no chalk boulders are to be found north of the headland. This goes to prove conclusively, if proof be needed, that the beach material travels to the southward.

The cliffs of the Holderness coast are made up entirely of soft glacial clays, capped in one or two places by lacustrine deposits of small extent. They vary in height from ten feet to fifty feet, and at Dimlington reach over one hundred feet. Mr. J. R. Boyle, F.S.A., has shown* on historical evidence, and the Rev. E. M. Cole and others have proved by direct observation,† that the whole of the cliffs from Bridlington to Spurn are being eroded at an average rate of about seven feet per annum. A walk along the cliffs at any point, especially in the spring time, will convince the observer that this estimate must be fairly accurate, or at any rate not under-estimated. As, therefore, the boulder-clay cliffs, varying in height from ten feet to over one hundred feet, are being washed away at seven feet per annum, the whole of that material must be gradually, or, as it is in some cases, quickly converted into gravel, sand or mud, and carried southwards.

It is generally admitted that a large quantity of the material is carried past the Humber mouth and is gradually silting up in the Wash and off the Lincolnshire coast, but at the same time a deal of the material must be brought into the Humber at each tide; and when the winds are the strongest, and the rate of erosion is consequently the most severe, the inrush of water into the Humber is likewise the greatest. This water brings with it the cliffs in a modified form. It would appear, therefore, that it is from the coast that the bulk of the material in suspension in the Humber waters is derived. Of course, it does not follow that the mud now in the Humber is the result of one or two tides. The particles in the water may have been accumulating during several months, and undoubtedly pass and re-pass a particular point several times a week. Consequently, when the rivers flowing into the Humber are swollen with flood waters, and are swift, the muddiness observed near the entrances to the estuary is not necessarily due entirely to the additional material which they have brought down, but is more likely to be owing to the sediment in the Humber being stirred up. About four years ago, during an exceptionally dry summer, the Humber water was, comparatively speaking, in a clear condition. This was not altogether due to the lack of material brought down by the rivers on account of their almost dry condition; rather may we attribute it to the fact that the mud was not stirred up to any extent, but was brought in by the Humber, deposited at high water, and left.

The work being done by geologists in connection with the deposits at the mouths of other rivers, suggests that a microscopic examination of the particles in the Humber water would probably enable it to be ascertained definitely whether the bulk of the material came from the cliffs of Holderness, or from the rivers Ouse, Trent and Hull. Unfortunately this cannot be carried out satisfactorily in the case of the Humber estuary, as particles of a precisely similar nature to those brought down by the rivers are also to be found in the cliffs of the east coast. Of course very fine mud, such as would be derived from clays, etc., can be of little assistance in the matter, but the sand grains and the particles of the uncommon minerals found amongst them are more likely to throw light on the question.

It must be borne in mind that the erosive action of the rivers is the greatest where the ground is the highest and the gradient the steepest, viz., at their sources. It is here that the current is the swiftest and consequently the rocks and soil on either side of and in the bed of the streams are dislodged and carried away. Very little erosion is going on near the mouths of the rivers. It naturally follows, therefore, that such particles as are brought down

* "The Erosion of the Holderness Coast."—Trans. Hull Geol. Soc., 1895-6, vol. iii., pp. 16-17.

† "Erosion of the Yorkshire Coast," 1892.—"Naturalist," 1893, pp. 142-144.

have come from their various tributaries, which stretch all through the north, south and west of Yorkshire, and in the case of the Trent, much of the material is brought from the Midlands, and even from the far side of the Pennine Chain.

The rocks found in the boulder clays, though of course only a small proportion of the bulk of the cliffs of Holderness, are precisely similar to those which the rivers at their sources pass through, and the problem is all the more complicated by the fact that the rivers traverse boulder clay areas. *A priori*, therefore, it would seem useless microscopically examining the particles in the Humber in order to ascertain their origin. The subject can only be viewed from a common-sense point of view, in which case it must be admitted that although a fair amount of sediment may be carried into the estuary by means of the rivers, the bulk of it is derived from the Holderness coast.

76, Sherburn Street, Hull.

BRITISH INFUSORIA.

By E. H. J. Schuster, F.Z.S.

Part I.—Flagellata Eustomata.

(*Continued from Vol. iv. page* 347.)

ALL the species hitherto described in this article have belonged to the family Euglenidae. We will now pass on to descriptions of commonly occurring representatives of some of the other families, viz., Astasiadae, Chrysomonadidae and Anisonemidae.

The Astasiadae are thus characterized by Saville Kent: "Animalcules mostly free swimming, exceedingly plastic and variable in form, bearing a single terminal flagellum, oral aperture distinct, endoplasm colourless."

Astasia trichophora Ehr.—The body of this animal is highly metabolic and changeable in shape. When fully extended, it is pear-shaped, or almost triangular, and 40 to 60 microns in length; the posterior portion is broad and the anterior tapers off to a point. The oral aperture is near the anterior extremity, and leads into a straight, tubular and conspicuous pharyngeal tract. Near the middle of this the contractile vacuole is situated. This organ, according to Bütschli, is not simple and spherical, but possesses lateral branches, into which the water is partially driven on contraction or systole. The endoplasm is colourless, and contains a large central spherical nucleus. The flagellum is thick and conspicuous, and about one and a-half times as long as the body; it is borne at the anterior end. The motions of the animal are of two kinds, swimming and body movements. The former is slow and steady and is brought about by wave-like vibrations of the anterior half of the flagellum, the posterior or basal half being kept almost steady and pointed in the direction in which the animal is moving. The other movement is effected by variable puckering of the cuticular surface and a more or less longitudinal contraction of the body: it is almost painful to see, resembling the writhings of an animal in sore distress.

The species was described by Ehrenberg, who mistook the basal half of the flagellum for an anterior neck-like prolongation of the body, as in *Trachelius trichophora*; but as subsequent investigators found out his mistake, this euphonious designation, so unlike the usual jaw-dislocating

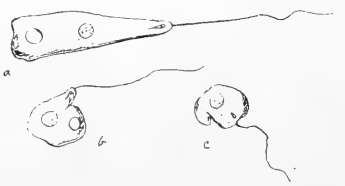


Fig. 8.—*Astasia trichophora*.
a, Expanded condition as when swimming (× 500).
b, *c*, Position when writhing (× 500).

combinations of sounds with which science has made us familiar, had to be with sorrow abandoned.

This animal is to be found usually in ponds and stagnant water, but owing to the numerous different shapes assumed by the body it might easily escape recognition. De Fromentel, in his "Études sur les Microzoaires" (Paris, 1876), gives a long list of various species of *Astasia*: *A. atriculus*, *A. deformis*, *A. turbo*, *A. fusiformis*, *A. crassa* and *A. regularis*; which, from his descriptions and figures, might easily be some of the various protean phases of *A. trichophora*.

Astasia flavicans Ehr.—This species is subfusiform in shape, the posterior extremity is produced into a blunt tail-like process, and the anterior extremity is somewhat rounded. The greatest diameter is behind the centre. The protoplasm contains numerous granules of a dull yellowish colour. The length of the body is about 50 microns, and the flagellum is twice this proportion. The

nucleus and contractile vacuole are as in *A. trichophora*.

The species may be found inhabiting ditch-water.

Astasia longifilis Perty.—The body is more persistent in form than in the other species. It is subconical in shape and 25 microns in length; the anterior half is marked by a longitudinal furrow or salcus. The protoplasm encloses some granules of a pale green colour; the flagellum is at least three times the length of the body.

This species was taken from a pond on Putney Heath under half an inch of ice.

There is only one other genus of the family Astasiadae, namely, *Colpodella*, which was established by Cienkowski. It differs from *Astasia* in possessing a suctorial oral aperture, but no pharynx. The following is the one species which he described:

Colpodella pugnax Cienkowski.—This animalcule is minute in size and predatory in habits; it might easily be mistaken for *Monas* or *Paramonas*.

The next family, the Chrysomonadidae, contains a large number of genera and species. I am afraid that it is but poorly represented here. The following are its characteristics as given by Saville Kent. "Animalcules bi-flagellate, rarely mono-flagellate, social or solitary, free swimming or adherent, naked loricate, or immersed within a common mucilaginous matrix or zoocytium; endoplasm always containing two occasionally green but more usually olive-brown or yellow differentiated pigment bands, one or more supplementary eye-like pigment spots usually present." These bands of yellow or green pigment are of firmer consistence than the rest of the protoplasm, and appear to resemble the diatomin or colouring matter of the diatoms.

Chrysomonas flavicans Ehr.—This species is plastic and changeable in form, the normal shape being

Fig. 9.—*Chrysomonas flavicans* (× 500).

more or less elongate and sub-cylindrical, three or four times as long as broad; flagellum is single, scarcely equalling the body in length. The endoplasm encloses two lateral pigment bands, which are lightish green in colour, and do not extend to the posterior margin. The contractile vacuole is large and spheroidal, and situated anteriorly. The nucleus is small and subcentral. The oral aperture is present, but not very much in evidence. The flagellum is single and produced from the centre of the anterior border. The size is from 14 to 42 microns.

The animal lives in ponds and ditch water.

Cryptomonas erosa Ehr.—This is free swimming and solitary; that is to say, its individuals do not grow together in united colonies. Its shape is ovate and compressed, about twice as long as broad, and recurved slightly towards the ventral side. It is rounded posteriorly, and anteriorly bears a prominent lip-like process, from the base of which the two flagella spring. These organs are approximately equal in length. Close to their base is a well-marked oral aperture leading into a

Fig. 10.—*Cryptomonas erosa* (× 500).

tubular pharynx, which in some cases extends almost to the centre of the body. The two pigment bands are light green in colour, and are longitudinally disposed. A conspicuous contractile vacuole is situated immediately dorsal to the commencement of the pharynx. The nucleus is subspherical in shape, and situated near the posterior extremity. This animal is about 24 microns in length.

C. erosa may be found in fresh water among confervae.

Uvella virescens Ehr.—This species is a colonial protozoon. The colonies are free swimming, and each is made up of numerous (from twenty to seventy) individuals united together by their posterior extremities to form rosette-like clusters. Each zooid is pear-shaped, the part by which they are united together being drawn out and stalk-like. The endoplast is spherical and subcentral. Under ordinary conditions it is very difficult to distinguish, but according to Bütschli the application of Beal's carmine at once reveals it. There are two contractile vacuoles situated posteriorly. The lateral pigment bands are yellowish-green, extending each side through almost the whole length of the body. About the number of flagella present there is some diversity of opinion. Ehrenberg observed two, Saville Kent gives two, Dujardin observed only one; I could only distinguish one.

This animal may be found in most ponds and

Fig. 11.—*Uvella virescens* (× 500).

ditches, rolling about in an apparently blind and aimless way.

The Anisonemidae are characterized by Saville Kent as follows: "Animalcules ovate or elongate, free swimming or temporarily adherent; flagella,

two in number, the anterior one, or 'tractellum,' locomotive and vibratile, the posterior one, or 'gubernaculum' used for steering, are trailed inactively in the rear during natation, adherent or anchorate by its posterior flagellum in the sedentary condition; oral aperture distinct, mostly associated with a well-defined tubular pharynx; endoplasm transparent, granular. Inhabiting salt and fresh water."

Anisonema grande Ehr.—The body is ovate or oblong, and flattened dorsiventrally. The dorsal surface is convex, the ventral one flat, or more or less concave; it is rounded posteriorly, and anteriorly becomes narrower; it is described by Dujardin as pip-shaped. It is about twice as long as broad, and from 20 to 30 microns in length. The cuticular investment is smooth and somewhat hardens, and may be found not decomposed after the death of the animal, The flagella originate a short distance from one another, close to the anterior extremity. The anterior vibratile flagellum, or "tractellum," is slender, and is about the same length as the body; the posterior one, or "gubernaculum," is three or four times as long as this, and is thick and strong at the base. The oral aperture is near the base of this, and communicates with a short tubular pharynx. The contractile vacuole is single, and situated just behind the oral aperture. The endoplast is spherical or ovate, and situated near

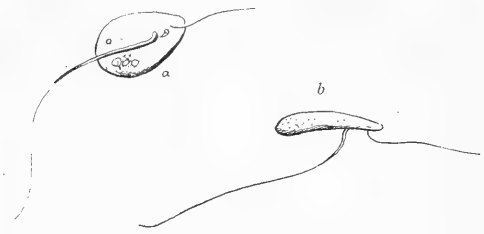


Fig. 12.—*Anisonema grande.*
a, Ventral; *b*, side view (× 500).

the posterior extremity. The free-swimming motion of this animal is straight and steady. It often anchors itself by its posterior flagellum, and swings slowly round and round its point of attachment.

The species is fairly common, and where it does occur, it is often found in large quantities. It may be searched for in ponds and ditch water.

(To be continued.)

SOME FOUNDERS OF GEOLOGY.

By Edward A. Martin, F.G.S.

THE study of geology is now divided up into so many branches, each of which has its own band of devoted specialists, that there are few men living who are sufficiently authoritative in all branches to be enabled to take wide and general, as well as accurate, views of geological science as a whole. It is with good effect that one can turn, therefore, to Sir Archibald Geikie's "Founders of Geology," and read the history of the early days of geology, when men were in the habit of regarding the subject from a broad all-round point of view. Certainly, through insufficient data, they fell into many and gross errors, but one sometimes wishes there were more nowadays who, as the late President of the Geological Society of London once said of Dr. Wheelton Hinde, dared to deal with the broader questions of geology. Sir Archibald speaks in this book appreciatively of the vast amount of work performed by one of the earliest "founders," viz., Guettard (1715–1786). He was the first actually to construct geological maps, sixteen sheets of a map of France being completed by him. He may be regarded as the father of all our geological surveys. He published writings dealing with the degradation of the land by rains, rivers, and sea-action. He showed that the material carried seaward was deposited around the coasts, and distinguished what we now call littoral deposits from those forming farther out at sea. Guettard was, too, the first to discover that in the centre of France was a group of extinct volcanoes. In 1752 he announced to the Academy that he had detected some sixteen or seventeen volcanic cones in the Auvergne, and that he had traced the ancient lava-flows to their now silent craters. In 1770 he read a paper on "Basalt." As his observations in Auvergne practically started the Vulcanist camp, so, says Sir Archibald, his tenets regarding basalt became the watchword of the Neptunists. In regard to his theory of the aqueous origin of basalt, he was thus a prophet of the great Wernerian theory.

Werner (1749–1817) himself published but little, his opinions being known principally from the works of his many devoted and enthusiastic pupils, in whom he seems to have instilled a kind of mesmeric attachment. Although it cannot be denied that Werner accomplished good work in some directions, yet "his influence was disastrous to the higher interests of geology." In regard to Wernerism, "never was a system devised in which

theory was more rampant; theory, too, unsupported by observation, and, as we now know, utterly erroneous." Werner thought it a highly probable conjecture that most, if not all, volcanoes arise from the combustion of underground seams of coal. His pupils consequently did all in their power to prove that his conjecture was fact: "what was true in doctrine," we are told, "was borrowed from his predecessors; what was his own consisted largely of unwarranted assumptions." This is severe criticism; yet none too severe for the man who by his wonderful influence put back the geological clock for half-a-century.

The greatest service that Werner did to the cause of geology was the enthusiasm he inspired for that science in so many capable men. The greatest check which his system received came, strangely enough, from his own pupils, D'Aubuisson (1769–1819) and Von Buch (1774–1853), who both abruptly exchanged, in turn, their opinion of the aqueous for the igneous origin of basalt. Whilst Wernerism was rampant throughout Europe, James Hutton (1726–1797) was quietly accumulating the material upon which was based his "Theory of the Earth." This was published in book form in 1795. "To its early inspiration I owe a debt which I can never fully repay," says Sir A. Geikie, of Playfair's "Illustrations of the Huttonian Theory of the Earth" (1802). The dominant idea of Hutton was that the present is the key to the past, and this constitutes the essence of uniformitarianism pure and simple. Two volumes only were published, of which a third remained in manuscript. Chapters iv. to ix. of the third volume remain still in the possession of the Geological Society of London, but the rest seems to have disappeared. Sir James Hall's (1761-1832) experiments in furtherance of Hutton's theory showed very important results. He found that thoroughly molten glass could, by slow cooling, be converted into a crystalline condition, thus discovering the importance of the rate of cooling in determining the resulting mineral. He selected samples of whinstones, *i.e.* intrusive dolerites, and basalts from Carboniferous dykes and sills round Edinburgh. These were reduced to the condition of perfect glass. Being re-fused, they were allowed to cool very slowly, when a substance was obtained "differing in all respects from glass, and in texture completely resembling whinstone." The establishment of stratigraphy in England was the work of William Smith, the Father of English geology. He was born in 1769. He was an engineer and surveyor, and every journey he took was made subservient to the great work of mapping the country. In 1815 his geological map of England was published. "What the most distinguished mineralogists during a period of half-a-century had done for a little part of Germany," said D'Aubuisson, "had been undertaken and accomplished for the whole of England by one man." Smith received the first Wollaston Medal in 1831; he died in 1839. Murchison (1792–1871) and Sedgwick (1785–1873) carried the principles of William Smith into the chaos of the old Greywaeké, adding to the geological record the Devonian, Silurian and Cambrian systems of strata. Then came the opening up of the Laurentian and Huronian chapters, as well as the rise of glacial geology, in the reform of which Agassiz (1807-1873) took the leading part. In the forefront of modern geology stand enshrined the names of Lyell (1797-1875) and Darwin (1809–1882), the former the great High Priest of Uniformitarianism, and the latter to be remembered as bringing vividly to the minds of geologists the imperfection of the geological record and the great lapse of time necessary for the deposition of the sedimentary formations.

Sir Archibald in his concluding chapter admits how increasingly difficult it is to keep pace with the ever-rising tide of geological literature. "One is almost driven in despair to become a specialist. . . . . But this narrowing of our range has a markedly prejudicial effect on the character of our work. . . . . One important lesson to be learnt is the absolute necessity of avoiding dogmatism."

69, *Bensham Manor Road, Thornton Heath.*

Dr. Lewis Swift.—This veteran observer was born on February 29th, 1820, and so has now reached his seventy-ninth year. He had long done good work, when, in 1882, Mr. Warner and others at Rochester, U.S.A., built an observatory and placed it under his direction, presenting him with a 16-inch equatoreal. Mr. Warner, however, unfortunately failed, and the observatory was closed. Then Professor T. S. C. Lowe arranged that Dr. Swift and his instruments be installed in an observatory at Echo Mountain in California, the surrounding place being a health resort. This resort and the observatory has now passed into the hands of a company which will not maintain the observatory; so the doctor is left with his telescope and library, and that is all, his means being very limited. These instruments and books cost £2,917, and he is trying to sell them. He discovered several comets and about 1,100 new nebula. He was the first to receive the Jackson-Gwilt gift from our Royal Astronomical Society. It is hoped that someone may come forward who can enable Dr. Lewis Swift to keep his treasures until his life's work is done. There must be many wealthy American gentlemen who would find pleasure in assisting one who has worked willingly and well, but without much reward.

CHAPTERS FOR YOUNG NATURALISTS.

(*Continued from Vol. iv. p.* 168.)

CRYSTALS IN PLANTS.

By B. H. How.

IT is a very interesting as well as extraordinary fact that crystals composed of mineral substances are constantly to be found embedded in the cells and cell-walls of plants. Sometimes they are found as solitary crystals, and sometimes in thickly-clustered groups.

These crystals are true minerals, and are found in two forms; the first being composed of calcium carbonate, and the second (which includes by far the larger number) of calcium oxalate. The latter is formed by sulphate of calcium being first absorbed by the roots from the soil, and then when it encounters oxalic acid in the plant it is decomposed by the acid combining with the lime, and oxalate of calcium is the result. These crystals generally crystallize into one of two systems, depending on the proportion of water. The first is the quadratic, and includes all the octahedral forms. The second series is the clinorhombic, and includes the acicular crystals called "raphides," so named from the Greek word "raphides" or needle. Masses of crystals are to be found in walnut leaves, but particularly in monocotyledonous plants, and in the bast tissue of trees. To see crystals well a fairly powerful microscope is necessary, but with the aid of an ordinary good one their varied and beautiful forms may be easily studied.

In the cells of some plants, notably those of the old-man cactus, crystals are so thickly embedded that when the plant is dried, fully eighty per cent. of the dried tissue is found to be composed of them. In the locust-bark they are also very numerous, but so small that a million and a-half has been found in a square inch not thicker than writing paper. Crystals are found very plentifully in the stems of rhubarb. If a small portion of the pulp be well boiled, then separated with a needle, after a drop of water has been added to it, and placed under the microscope, the needle-shaped crystals will be easily seen. Small prismatic crystals lie hid in the cuticle, or brown outer coat, of the common onion. Many are also to be found in lichens, on the outer surface of the walls of the cells.

Although crystals are formed first in the protoplasm of plants, they gradually find their way to the cell sap and then to the inner or outer surface of the cell-walls. If a little milky juice from the dandelion be placed under a microscope it will be seen to contain many beautiful raphides, and the juice of the common hyacinth also contains them. They are found in the leaves of the bulb of the medicinal squill, and in the stems of the *Calla*, the *Arum* and the *Aloe*. In the *Iris* and the Turkey rhubarb they are found in the roots. In the latter they are so numerous as to give quite a gritty taste if chewed.

Sometimes plant crystals are so united as to form beautiful stellate bodies, and occasionally they assume circular crystalline masses, especially in the Cactus family. Raphides are only found as a rule in cells that contain no other granular contents. Crystals in the form of cubicles are to be found in some plants. Occasionally other substances besides oxalate of lime are found crystallized, as when on the under surfaces of the leaves of the *Deutzia scabia*, a garden shrub, beautiful crystals of silica can be seen in a stellate form. Crystals of sulphate of lime are often found hidden in plants of cycadaceous origin. Those composed of calcium carbonate are found in the cell-walls of certain of the Urticaceae and in the protoplasm of the Myxomycetes — those extraordinary fungi which differ so much from all the other fungi in structure, being composed only of masses of protoplasm, called "plasmodia." In the monocotyledonous plants crystals can be easily detected, and in the wood of conifers.

The student must be careful not to confuse crystals with crystalloids, which differ entirely in their composition; crystals being formed of mineral and crystalloids of vegetable substances. The latter are composed of "proteinaceous or nitrogenous material, closely allied to protoplasm." In shape and appearance they very nearly resemble crystals, as they take cubical, octahedral, rhomboidal and tetrahedral forms, and in water are insoluble. They are found in the tubers of potatoes, in marine red algae, and in oily seeds, like those of the Brazil nut. When they break up they appear as if composed of several hard layers. One great difference to be observed between them and crystals is that they expand largely under the influence of certain "re-agents," whilst true mineral crystals do not.

The study of crystals is indeed a most interesting one, and will well repay the earnest student of nature. Patient attention must be given to preparing subjects for the microscope, but when that is done he will be amply rewarded by the beautiful and varied forms that will meet the eye and delight the heart.

Bournemouth, 1898.

A WHALE IN CHANCERY.

IN Dr. Laver's recently published work on the Vertebrates of the County of Essex (noticed on p. 18 of this number) reference is made to an example of the rare Rudolph's rorqual (*Balaenoptera borealis*) which was taken in the River Crouch in 1883. There are several points of interest about the specimen that may as well be placed on record. As Dr. Laver states, this individual was described by Professor, now Sir William Flower, K.C.B., in the "Proceedings of the Zoological Society," 1883, p. 514; it is recorded in the "Transactions of the Essex Field Club," vol. iv. p. 3, and in the "Zoologist," 1886, p. 129. I went down from London to see this whale, on hearing of its capture by telegram, and from my notes gathered at the time, the following particulars may be of interest to some of our readers.

This rorqual was taken by three Southend fishermen early on the morning of November 1st, 1883. They were working at their avocation in the River Crouch, near Burnham, when it was first observed floundering in about eight feet of water. One of the men threw a couple of can-hooks which lodged in its head. The huge beast naturally then became very violent, opening its enormous mouth and making much noise. After a fight lasting about five hours the men managed to slay the creature with the aid of a crowbar and chisel. As the tide rose the men towed it up to Cricksea Ferry, on the south side of the river. There it was when I saw the specimen the next day. Three days after capture it was conveyed by road, with the aid of a traction engine, to Southend, and there exhibited.

On behalf of Professor Ramsay, of New South Wales, who was then in England in connection with the Fisheries Exhibition, I purchased this whale, and he had it dissected by Messrs. Gerrard, of London, and the skeleton was sent to the Antipodes for the Government Museum, then in Professor Ramsay's charge, at Sydney. One incident connected with the skeleton was that, as the animal was getting rather "high," the local sanitary authorities instructed a veterinary surgeon to eviscerate it. During the process he sawed off a number of the ribs, near their points. These tips were found to have been buried with the contents of the abdominal cavity, and, disagreeable as was the task, they were exhumed and placed with the remainder of the bones for export. Perhaps our Australian readers may be able to tell us whether the skeleton is now at Sydney.

The specimen when in the flesh was about 30 feet in length and 14 feet to 15 feet in girth. The baleen, or whalebone, was quite short, the longest shreds being under 13 inches; it was of a dark slaty-brown colour, with whitish fringe. In general colour the back of the animal was of a rich glossy black, which shaded to a brilliant white on the abdomen; the flippers were black, as was the high dorsal fin. The deep serrations on the underside of the body extended along about two-thirds of its length from the lower lip.

When dissected, the skull of the Burnham specimen, as measured by Sir William Flower, was 6 feet 2 inches in length, and the complete vertebral column 22 feet 3 inches, making 28 feet 5 inches from the apex of the rostrum to the end of the last caudal vertebra. This would give the full length in the flesh as at least 29 feet. There were about 300 blades of baleen each side of the mouth of this specimen, but they were difficult to count on account of their gradually degenerating at the extremities of the series, especially in front, into little more than bristles.

The specimen from which Rudolphi described the species was washed ashore or stranded on the coast of Holstein in 1819, and the skeleton is now at the Berlin Anatomical Museum. The records in Britain of this whale having been seen by persons capable of forming a scientific opinion of its specific identity, are few. An adult representative at the Natural History Museum was taken in the Thames at Tilbury in 1887. It is apparently the rarer of the four species of rorquals known to occur in the North Atlantic Ocean.

Sir William Flower thought, in 1883, that Lesson's specific name, *borealis*, had undoubted priority for this rorqual, and we are not aware that it has been superseded. The synonomy of the whales is a difficult and confusing subject.

The specimen of *Balaenoptera* under notice became celebrated from another cause. It was put into Chancery, and became a claim in the High Court of Justice. The claimant was Sir Henry Mildmay, lord of the manor of Burnham, who, to maintain certain collateral rights far more valuable than a whale, claimed the "fish" under the ancient charter powers inherited with the manor. It is needless to say that the word "fish" as applied to whales comes to us from remote times when lawyers and the barons who then made the Acts of Parliament, neither knew nor cared for such fine points of fact as the difference between mammal and fish. So they grouped in the Act sturgeons and whales as royal fish. It was under that Act that Sir Henry obtained his judgment. The Act or custom provides that to the King belongs the head of a whale, and to the Queen its tail, because popular opinion at that time thought the whalebone was produced in the caudal appendage, which was, therefore, most suited to Her Majesty. The royal franchise of the manor of Burnham also extends to royal birds, and the time previously when the right was exercised by the lord of the manor was early in the seventeenth century, when some swans were claimed.

JOHN T. CARRINGTON.

ARMATURE OF HELICOID LANDSHELLS.

By G. K. Gude, F.Z.S.

(Continued from Vol. iv. p. 285).

A FEW more species of *Plectopylis* remain to be described and figured. Their consideration has been delayed on account of authentic specimens being inaccessible to me; in one case no figures have yet been published, while in another case, where the species is supposed to have been illustrated, the figures represent another form. These are *Plectopylis repercussa*, *P. anguina*, and *P. refuga*, all described by Dr. A. A. Gould. In the present instalment I will discuss *P. refuga* together with *P. leiophis*, which has been confused with it in some quarters, leaving *P. repercussa* and *P. anguina*, and sundry other allied species for consideration in future instalments of these papers. *Plectopylis repercussa* has recently been regarded as synonymous with *P. achatina*, but whether justly so or not, it was impossible for me to decide, as the type specimens of the former, as well as of the other two species, are in the possession of the New York State Museum, Albany, N.Y., and my request for the loan of them was referred to the Trustees, who decided not to let the specimens go out of the country. The Director, Dr. Merrill, however, very obligingly had the shells photographed and their armatures sketched for me. I have thus the pleasure of being able to lay authentic figures before my readers. I am much indebted to Dr. Merrill, as well as to Dr. Bagg, his assistant, who made the sketches and furnished valuable notes, which, together with the photographs, enabled me to clear up the doubtful points in connection with the three species in question.

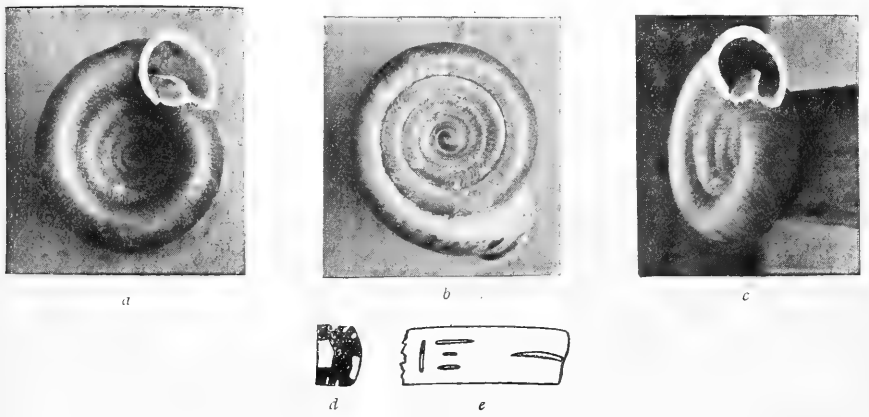


Fig. 75.—*Plectopylis refuga.*

Plectopylis refuga (figs. 75*a-e*), from Tavoy, Burma, was described by Dr. Gould in the "Proceedings of the Boston Natural History Society," ii. (1846), p. 99. This species has not hitherto been illustrated, as the figures given by Philippi, by Reeve, and by Küster were taken from the specimens in Cuming's collection, now in the British Museum, and these specimens, although labelled *P. refuga*, are not that species, but *P. leiophis*, as careful comparison with Mr. Benson's type specimens has convinced me. I have been unable to obtain any specimens of *P. refuga*, and I am therefore compelled to rely upon Dr. Gould's description, supplemented by the notes and sketches by Dr. Bagg, and by the photographs now reproduced. Dr. Gould described the shell as "sinistrorse, discoid, flat above, concave below, greenish-corneous; whorls, six, closely coiled, thickly striated, the last deflexed near the aperture; suture impressed; aperture very oblique, heart-shaped; peristome white, reflexed, connected by a sinuous callus; a white flexuous plate revolving in the penultimate whorl." He further remarks that "this remarkable shell is almost exactly like *Helix carabinata*, Fer. [*Corilla rivolii*, Desh.], except that it is reversed, and has no lamellae revolving within the outer lip." From the above description it is impossible to know which form Dr. Gould had before him, as it applies equally to several distinct shells.

The following notes have been communicated by Dr. Bagg: "*Helix refuga*, Gould, catalogue number, 271; original number, A 562. Two earliest volutions smooth, remainder of shell very finely striate and hairy. Outer volution on lower side angular. Greater diameter nearly $\frac{3}{4}$ inch [= 19 millimetres]; smaller diameter, $\frac{9}{16}$ inch [= 14 millimetres]; alti-

tude, $\frac{5}{32}$ inch [= 4 millimetres]; length of horizontal fold at aperture, $\frac{3}{16}$ inch [= 5 millimetres]. Basal denticle [*i.e.* vertical parietal plate] cup-shaped."

From figs. 75*d* and *e*, which have been copied from Dr. Bagg's sketches, it appears that the parietal armature consists of a strong vertical plate which is concave posteriorly; on the posterior side there are three short horizontal folds, the upper longest, the median shortest; a short horizontal fold at the aperture is united to the flexuous ridge (see fig. 75*e*, which shows the parietal wall); while the palatal armature appears to consist of six folds: the first three short and horizontal; the fourth strong, vertical, slightly indented about the middle; the fifth and sixth horizontal and thin (see fig. 75*d*, which gives the posterior aspect of both armatures). Figs. 75*a-c* are reproduced from the photographs of the type specimens, enlarged two diameters. Mr. W. T. Blanford has recorded the following additional habitats for this species: Pegu and Tenasserim (in "British Burma Gazetteer" (1879), i. p. 709).

Plectopylis leiophis (figs. 76*a-c*) from Thayet Myo, Pegu, was described by Mr. Benson in the

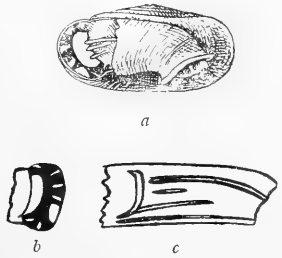


Fig. 76.—*Plectopylis leiophis.*

"Annals and Magazine of Natural History" (3), v. (1860), p. 246, and illustrated by Lieut.-Colonel Godwin-Austen in the "Proceedings of the Zoological Society," 1874, t. 74, fig. 2, who subsequently (*ibid.* 1875, p. 44) stated that this shell was identical with Dr. Gould's *P. refuga*, basing this identification on the specimens in the British Museum, so labelled by Mr. Cuming. Upon comparing these latter with Mr. Benson's type specimens, obligingly lent to me by Mr. Harmer, of the University Museum of Zoology, Cambridge, I found they were certainly identical, but as already stated, the specimens in the British Museum were wrongly identified. They formed the subject of the illustrations purporting to represent *P. refuga* in Dr. R. A. Philippi's "Beschreibungen und Abbildungen neuer oder wenig gekannter Conchylien," iii. Helix, t. 10, f. 4; in Reeve's "Conchologia Iconica," t. 82, f. 436, and in "Martini und Chemnitz, Conchylien Cabinet" (2), i. t. 66, ff. 21-23. All these figures, therefore, must be referred to *P. leiophis*. This species was also figured in Hanley and Theobald's "Conchologia Indica," t. 13, f. 8. In addition to the original habitat, the species has been found at Kivadouk, and Akoutoung on the Irawady, below Prome (W. T. Blanford, Journ. As. Soc., Bengal, xxxiv. (1865), p. 75). I very much doubt that Mr. Benson was acquainted with *Plectopylis refuga*, although Mr. Blanford believes he knew the species. Mr. Benson, in discussing *P. leiophis* (Ann. Mag. Nat. Hist. (3), v. (1860), p. 246), mentions, it is true, *P. refuga* var. *dextrorsa*, but this form, as has already been shown, is allied to *P. brachydiscus* (*c.f.* SCIENCE-GOSSIP, iii. p. 154) and is quite distinct from *P. refuga* and *P. leiophis*. A specimen in the McAndrew Collection, in the University Museum of Zoology at Cambridge, which contains Mr. Benson's types, is labelled *P. refuga*, but I refer this without hesitation to a form of *P. achatina*. *P. leiophis* is sinistral, discoid, pale rufous-corneous, finely and regularly striated, decussated by microscopic spiral lines on the upper surface, spirally wrinkled at the side and below. The spire is depressed, the apex raised a little above the plane of the other whorls, and the suture impressed. There are six and a-half narrow rounded whorls, which increase very slowly and regularly; the last being angulated above the periphery, shortly and abruptly descending in front, widening a little towards the aperture, and slightly constricted behind the peristome. The aperture is roundly cordate, oblique; the peristome white, thickened and reflected; the margins converging and united by a raised curved ridge on the parietal callus, slightly notched at the lower junction. The umbilicus is wide and moderately deep. The parietal armature consists of a strong vertical plate, angular above, where it gives off posteriorly an abruptly descending short ridge, while below it deflects obliquely, and on the anterior side it gives off a short horizontal fold; a long free horizontal fold rises close to the vertical plate a little below its upper extremity, revolving parallel with the whorl as far as the aperture, where it unites with the ridge on the parietal callus; between this fold and the lower one just referred to, occurs a very short, free, horizontal fold, but this does not appear to be constant, as it is absent in a specimen in Mr. Blanford's collection, while in an immature specimen in my collection, it appears as two small coalesced folds, and in this instance an additional elongated denticle occurs between it and the upper long fold; in all the other specimens examined, however, the parietal armature is identical with that of the type specimen. A very thin, free horizontal fold rises below the vertical plate, running close to the lower suture, and terminating close to the ridge at the aperture. The palatal armature is composed of six folds, five

horizontal and one sub-vertical; the first is thin, horizontal, parallel with and near to the suture, slightly indented about a third of its length from the posterior termination; the second stouter and longer, also horizontal, slightly depressed, and indented near its posterior termination; the third stout, horizontal, but shorter than the first, also indented near the posterior extremity; the fourth, stout, horizontal, shorter than the third, bluntly triangular, the apex reflexed, and having a slightly elongated thin denticle posteriorly in a line with it; the fifth, stout and very short, sub-vertical, obliquely crescent-shaped, the concave side towards the aperture and lower suture; on the posterior side, near the lower extremity, occurs a small denticle; the sixth is short, but broad, horizontal, and it has an elongated dentical posteriorly. The specimen figured is in Mr. Ponsonby's collection, and is from Pegu. It measures: major diameter, 13·5 millimetres; minor diameter, 11·5 millimetres; altitude, 5 millimetres. Two specimens in my collection, from Akoutoung, are a little more raised in the spire and less angular above the periphery; they measure 14 millimetres in diameter; altitude, 6 millimetres.

An immature specimen in my collection, having five and a-half whorls completed, is interesting from the fact that it possesses the set of barriers nearly identical with that of mature specimens; but the upper horizontal parietal fold is very short, only about one quarter of the length of that in old specimens, the anterior portion being absent; the thin lowest fold runs as far as the aperture. As already mentioned, the second fold appears as two coalesced folds, and an additional denticle occurs between it and the upper fold.

ADDENDUM. — *Plectopylis pseudophis* (figs. 77*a* and *b*).—Since writing my remarks upon this species (vol. iv., p. 170, f. 62), I have been fortunate in obtaining a specimen through the kindness of the Rev. R. Ashington Bullen. I am thus able to supplement my former notes and figures, which were copied from other sources, as at that time I had not examined the armature. The specimen in question differs from the type of *P. pseudophis*, as described by Lieut.-Colonel Godwin Austen, in having an additional short fold between the long upper and the short lower parietal fold, resembling in this respect *P. leiophis*; but as already stated, when discussing that species, this character appears to be an inconstant one. The palatal armature consists of: first, a short thin horizontal fold near the suture; secondly, a longer horizontal fold, somewhat deflected posteriorly, with an additional short wedge-like fold attached to it, which has posteriorly, a little above it, a small denticle; thirdly, a shorter horizontal fold widened towards the posterior extremity, then suddenly attenuated and indented, and finally again widened a little; fourthly, a short, slightly curved horizontal fold, descending a little posteriorly, also slightly attenuated and indented near the posterior extremity; fifthly, a crescent-shaped, sub-vertical fold (the concave side being towards the aperture and the lower suture), with a small denticle near its posterior extremity; and sixthly,

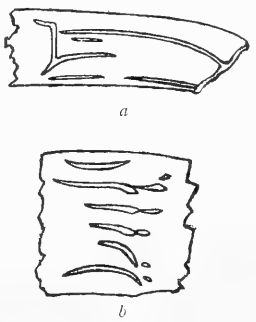
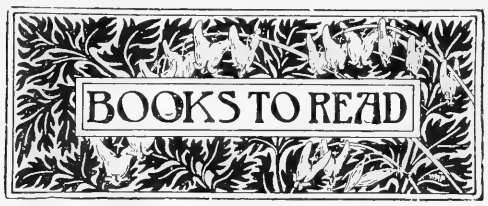


Fig. 77.—*Plectopylis pseudophis*.

a longer curved horizontal fold, having its upper edge reflected towards the fifth fold, and possessing a small denticle near its posterior extremity.

(*To be continued.*)

NEW WORK ON LEPIDOPTERA. — Mr. J. W. Tutt, F.E.S., is passing through the press a new work on Lepidoptera. It is to be devoted to a critical examination of the order, especially as represented in Europe, and will include the divisions of Macro-lepidoptera and Micro-lepidoptera. It is expected to appear early in the autumn. The author is publishing it by subscription at 15s. the volume before issue, and one guinea afterwards. The chief feature of this work will be a new scheme of classification based entirely on recent research by Messrs. Dyar and Chapman. This is well-known to advanced entomologists, and is of great scientific importance. We may therefore expect some remarkable changes in the direction of the study of the order. The preliminary chapters of the book will consist of (1) The Origin of Lepidoptera, (2) The Lepidopterous Egg and its Evolution, (3) Parthenogenesis, (4) The Embryology of a Lepidopterous Insect, (5) The External Structure of a Lepidopteron, (6) The Internal Structure of a Lepidopterous Insect, (7) The Variation of the Margins of Lepidoptera, (8) Defensive Structures and Protective Coloration of the Larvæ, (9) Classification of Lepidoptera. These chapters occupy about 112 pages of the work. The second part of this work will consist of a monograph of the Sphingo-Micropterygid Stirps, of the Nepticulid moths, the Eucleides, the Authercerides and the Lasioampides. This part is well forward, in fact nearly completed. Mr. Tutt has received important assistance from several of the leading British lepidopterists who study the order from the point of view of an exact science. Intending subscribers should apply direct to Mr. Tutt, Rayleigh Villa, Westcombe Hill, London, S.E.



NOTICES BY JOHN T. CARRINGTON.

The Flora of Perthshire. By FRANCIS BUCHANAN W. WHITE, M.D., F.L.S., F.E.S. Edited by JAMES W. H. TRAIL, M.A., M.D., F.R.S. 420 pp. 8vo, with portrait and map. (Edinburgh: William Blackwood and Sons, 1898.)

In editing the unfinished manuscripts and filling the gaps left incomplete in the material gathered by the late Dr. Buchanan White, Dr. Trail has been judicious. That he has toiled as a labour of love for his departed friend is evident when one examines page after page of the flora before us. Dr. Trail has well done his portion of the book, and the members of the Perthshire Society of Natural Science, who are really responsible for the work, were fortunate in securing the aid of so eminent a botanist. Before proceeding to the flora proper, Dr. Trail commences with a valuable explanatory introduction, and a memoir of Dr. White, to which is added an address by him on the origin of the flora of Perthshire, also a list of his published articles, upwards of eighty being on botanical subjects. There is a useful appendix, critically examining some plants left out of Dr. White's MS. list, and the addition of some others. We have, therefore, in the joint work of the authors, an excellent result, and one which is sure to become authoritative. White's work alone is a guarantee for accuracy. We cordially welcome the new "Flora of Perthshire," which should be secured by every scientific botanist for purposes of comparison and the study generally of the distribution of plants in North-Western Europe.

The Mammals, Reptiles and Fishes of Essex. By HENRY LAVER, M.R.C.S., F.S.A., F.L.S. 146 pp. 8vo, with 10 illustrations. (London: Simpkin Marshall, 1898.) 10s. 6d.

This interesting book is vol. iii. of the "Essex Field Club Special Memoirs," the former two being on the "Earthquake of Essex in 1884," and on the "Birds of Essex." The volume before us is a good type of a local list in any branch of biology. It commences with a useful introduction, describing the physical features of Essex, and proceeds to a lengthy summary of the different divisions of the vertebrate fauna, exclusive of birds, occurring in the county. In connection with the fishes are some pages upon the fisheries of the county, both marine and freshwater. From this summary we learn there have been identified as recently found in Essex thirty-eight terrestrial mammals, ten marine mammals, four reptiles, six amphibians, and 113 fishes, making a total of 171 species, which number does not compare very well as against the total for Britain of 324. In dealing with each kind of animal, Dr. Laver very properly avoids all technical descriptions, but in nearly allied cases, as among the bats, he points out distinguishing features in appearance and habits, which will help to identify them when found. The author also tells us about his successes in keeping in captivity various members of the fauna, which make pets readily or otherwise. The records for marine fish and mammals form the weakest part of the list of Essex fauna. We imagine the numbers of these species will be increased as more attention is paid to them by someone with ample opportunity. As a basis for future reference and record, this work should be in every naturalist's library, as well as in that of every country gentleman in the county.

Missouri Botanical Garden Ninth Annual Report. 160 pp. large 8vo, with 5 illustrations and 50 plates. (St. Louis, Mo.: at the Gardens, 1898.)

The Annual Report for 1897 of this well-managed institution is as attractive and scientifically useful as ever. The balance sheet shows, after all expenses, a sum in hand for the year, of over £450. The report proper is complete in a dozen pages, so there is ample space left in the book for printing a number of scientific papers that are beautifully illustrated. Among them are some of considerable importance, for instance, "A Revision of the American Lemnaceae north of Mexico," with four plates. This we have previously noticed from advance sheets. There is "A Revision of the genus *Capsicum*," with twenty plates, etc. Dr. William Trelease, the Director, is to be congratulated on the excellence of the report for 1897. The literature of the Gardens may be obtained through Wesley and Son, Booksellers, Essex Street, London, at about cost price, which, unfortunately, is not stated.

County and Vice-County Divisions of the British Isles. By ALEXANDER SOMERVILLE. One sheet. (Glasgow: A. C. Burns, 1898.) 4d.

Mr. Alexander Somerville, B.Sc., F.L.S., of Glasgow, has issued on a single sheet, suitable for framing, the "County and Vice-County Divisions of the British Isles," for biological purposes. The publication has been arrived at after consultation with many authorities. The table for Great Britain is based on Watson's arrangement for 1852. The Irish table is the forty divisions suggested a couple of years ago by Mr. R. Lloyd Praeger. Added to the sheet are explanations which will be useful. It will be of value to zoologists and botanists alike, and should be obtained by museums and societies, as well as by naturalists generally. These sheets are supplied by A. C. Burns, 383, Sauchiehall Street, Glasgow, the postage being three-halfpence. If there is a fault the large size is rather against the usefulness, though the print is clear and easily read.

Practical Radiography. By A. W. ISENTHAL and H. SNOWDEN WARD. 155 pp. large 8vo, second edition, with numerous plates and illustrations. (London: Dawbarn and Ward, Limited, 1898.) 2s. 6d.

The first edition of this handbook was issued in May, 1896, soon after Professor Röntgen's discovery; therefore it will be readily understood that the work has been almost re-written in consequence of the advance in radiography. In the edition before us the original writer, Mr. Snowden Ward, has had the advantage of the co-operation of one of the leading specialists, Mr. Isenthal, who has studied this branch of photography in practical use in surgery and otherwise. The progress made during the short period since the X-rays were first applied to portraying hidden objects is most remarkable. This book will be found most useful to those whom its subject especially interests.

Birds in London. By W. H. Hudson, F.Z.S. 339 pp. royal 8vo, illustrated by 17 plates and 15 illustrations in text. (London, New York and Bombay: Longmans, Green and Co., 1898.) 12s.

This beautifully produced book will gladden the heart of many a lover of nature who has few opportunities of taking extended rambles in the wilder country beyond suburban London. It will show such lovers of bird life that a closer attention to the feathered denizens of the metropolitan district will often reveal unexpected and welcome strangers. Mr. Hudson, whose name is well known in association with ornithological studies in towns, has pleasantly written a most entertaining and suggestive work on urban bird lore. It is indeed astonishing what a fine observing ground is the metropolitan district for naturalists. Whether they be ornithologists, entomologists, or what not, the County of London contains no end of living representatives to incite their interest. If we search through the magazines devoted to natural science during the past half century we shall find therein recorded many rare birds moths, and plants which have been found within a five-mile radius of Charing Cross. It is needless to point out that some of these are stragglers, and not permanent denizens, but that makes them none the less interesting. There are nevertheless some wild birds, shy enough in the country, which are losing their timidity when visiting or residing within the sound of "Bow Bells." Among the more timid are the wood pigeons and the field-fares, the latter in recent years being frequently seen in the harder winters. By permission of the publishers, and as an example of the beautiful illustrations in this work, we reproduce the picture of these birds by A. D. McCormick, who, with Bryan Hook, has produced a picturesque series of plates and vignettes. In addition to these there are photographs from nature by that celebrated bird photographer, R. B. Lodge. The Local Government Act which created the County of London, with its ruling County Council, was an unforeseen benefit to London naturalists, for it extended the area which could be included in such a work as this before us, and better still, gave the much needed power for the protection of birds against the slinking bird-catcher or the cockney sportsman. In writing this book Mr. Hudson has succeeded in compiling much pleasantly-written bird lore which will appeal to a large audience beyond the narrower realm of ornithologists. Some of his instances are indeed quite startling to the professional bird student, though the adaptation of wild birds to men's civilization has ceased to be astonishing. We have ourselves noted within the last few years a pair of redstarts which built a nest and successfully reared a brood of young in the Embankment gardens, at the ancient water-gate by the end of Buckingham Street, Strand. Not less remarkable was a case we observed of a nightingale that sang daily for more than a week in some lilac bushes in Whitehall Gardens, nearly opposite the Horse Guards. During the past winter, one Sunday afternoon, we saw a magpie feeding unconcernedly among a number of wood-pigeons, within twenty yards of a crowded path in St. James's Park. It need not, therefore, surprise the uninitiated if any bird should be unexpectedly seen. Taking Mr. Hudson's book as a guide, the observation of birds in the County of London will form a charming recreation for many who are not professedly ornithologists.

Fieldfares at the Tower of London
(*From Hudson's "Birds in London."*)

Caradoc and Severn Valley Field Club Transactions for 1897. 88 pp. large 8vo. (Shrewsbury, 1898.)

The "Transactions" of this society indicate considerable activity among the members. The work of the year included numerous meetings, when many exhibits were presented and useful papers read and discussed. The titles of some of these were "Protective Mimicry in Insects," "The Severn," "The Study of Mosses," "Our Wild Birds," "Coal Mining," "Theories of the Origin

of Volcanoes," "British Birds' Nests," etc. There were also a number of excursions, and meetings were held at Wellington, as well as at Shrewsbury, in which latter town is the Club Room at 37, Castle Street, Mr. J. A. Panter being the Hon. Secretary.

Metric Equivalents of Imperial Weights and Measures and Thermometric Equivalents. 12 pp. large 4to. (London: Pharmaceutical Journal Office, 1898.) 1s. 6d.

This is an important and most useful compilation for comparison of the value of weights or measures expressed either by metric or imperial standards, and the equivalents in degrees of temperature of centigrade (Celsius), Fahrenheit and Réanmur. The cause of the issue of these tables by the Pharmaceutical Society is that the metric system of weights and measures is now legalised in the United Kingdom for the purposes of trade. The book will be found of great value to persons requiring to find the quantities expressed in either system, when judged by the other. The Society will do much to familiarise people with the use of the metric system by publishing the tables before us.

Garden Making. By L. H. BAILEY. 425 pp. 8vo, 256 illustrations. (New York and London: Macmillan and Co., 1898.) 4s. net.

Although this useful work was written in America for Americans, it will be found very suggestive to persons on this side of the Atlantic. Gardening for luxury's sake, as practised in Europe, is only in its infancy on the western continent. We do not mean that in the neighbourhoods of large cities of the eastern states there have not been fine gardens for years past, but that generally, all over both the States and Canada, the art of beautifying the home plot has only latterly received attention. For such cases is this book written, and it will go far to make the home lovely in many a place where such things as flowers have too frequently had but scant thought.

County Down: Belfast and County Down Railway Company's Official Guide to County Down and the Mourne Mountains. By ROBERT LLOYD PRAEGER, B.A., M.R.I.A. 337 pp. 8vo, with 70 views of scenery, maps, and other illustrations. (Belfast: Marcus Ward and Co., Limited, 1898.) 1s.

It has seldom been our pleasure to take up a more satisfactory official guide to any place. It is quite unconventional, well arranged, and a companion to the educated tourist. Every taste is catered for in these pages, and those which will appeal to the readers of this magazine are most satisfactory. The author of this guide is such a well-known naturalist that it is a relief to be able to read his remarks on scientific subjects, knowing they will be correct. This department of the book will do much to attract English readers to visit the beautiful country served by the railway company which has had the enterprise to publish so unique a little work. Although natural history is treated at length in the first section of the book, it is not all packed in one chapter, but is pleasantly interwoven with the descriptions of places, or dealt with in special paragraphs. There is not any slipshod literary work in this book, as will be seen by examining the tables of reference to other works at the end of the various places described. Their correctness is remarkable, and an unusual feature in guide books. The pages show evidence of personal visits by the author to the localities mentioned. The railway company has done wisely to place the work in such competent hands. The illustrations are excellent, being chiefly from views taken by that celebrated landscape photographer, Mr. Robert Welch, of Belfast.

NOMENCLATURE OF SHELLS.—Mr. Alfred Bell (*ante* vol. iv. p. 353) will find the best authority for the generic and sub-generic nomenclature of the Helicidae in "Tryon's Manual of Conchology," now edited by H. A. Pilsbry. The latter eminent malacologist has produced by far the best and most satisfactory classification of this most difficult group, and we followed him. Mr. Bell will find all his queries answered in that work, which was not in existence when Mrs. Hughes wrote her paper. A further change will, we fear, have to be made in future under the laws of priority, and *Cyclostoma elegans* will finally figure as *Pomatias reflexus*, Linn. O the pity of it!—*A. Santer Kennard and B. B. Woodward, London.*

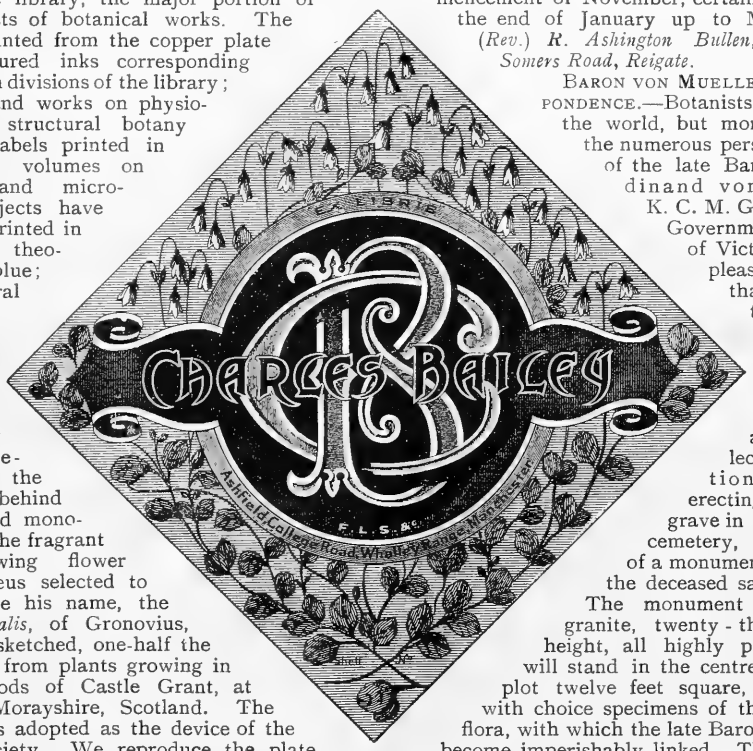
FIVE-BANDED SHELLS WANTED.—Our correspondent, Mr. Arthur E. Boycott, writes: "Would you ask your readers in SCIENCE-GOSSIP if any of them will send me some 'takes' of *Tachea* similar to the Irish one you mention in the last number in such an interesting way. The more specimens, of course, the better, and it is extremely desirable that they should be collected on the principle of taking every adult specimen found. They need not, of course, be cleaned out, and fragments are very nearly as good as whole specimens." Mr. Boycott's address is The Grange, Hereford. I feel sure many of our readers will be glad to assist in the elucidation of the complicated band and general variation question of *T. nemoralis* and *T. hortensis*. I shall myself always be pleased to correspond with those interested in the subject and to receive specimens for examination. In sending "takes" to either Mr. Boycott or me, it is particularly necessary to keep those from each locality separate, and mention its name, with some description of the surrounding soil, etc.—*John T. Carrington, 1, Northumberland Avenue, London, W.C.*

A HARDY PLANT.—At the beginning of January I bought for a shilling a small plant of *Ardisia crenulata* in a pot. I placed it in the centre of my dining table, and there it has been, with scarcely a change, ever since, and still it is as bright and fresh as ever. A plant that will stand four months of life in the middle of a room, with a daily fire and gas burning every night, is something of a treasure. *Ardisia* is a pretty plant too. My little specimen is only nine inches high, but it has a pretty crown of bright green glossy leaves and three bunches of showy scarlet berries below. It is a native of China and belongs to the order Myrsineae, which includes the trees and shrubs that would otherwise be ranged with the herbaceous order Primulaceae.—*F. T. Mott, Crescent House, Leicester.*

CAMTOGAMMA FLUVIATA.—It has often struck me as peculiar that this pretty moth should now be so scarce. It was always considered a "good thing" among the Geometers, and used to be recorded on capture, about the later middle portion of the century. As often as anywhere in those days it was taken at the light of south-western suburban London gas-lamps. There were

several broods of this moth being reared in captivity in various parts of the country, about the end of the sixties. It was the custom to keep the larvæ warm during the winter, when they were fed on groundsel, and as many as three broods of perfect insects could be reared each year. Many lepidopterists remember the time when the males and the females of this geometer were considered as distinct, and were called respectively *Camtogamma fluviata* and *C. gemmaria*. As such they appeared in the late Mr. Stainton's excellent "Manual of British Moths." Rearing them through their various stages cleared up that difficulty, as it has many another. — *John T. Carrington.*

A Botanist's Book-plate.—The accompanying book-plate has been devised by the owner of a large private library, the major portion of which consists of botanical works. The labels are printed from the copper plate in dark-coloured inks corresponding with the main divisions of the library; thus floras and works on physiological and structural botany have their labels printed in dark green; volumes on zoological and microscopical subjects have their labels printed in dark brown; theological, dark blue; travels, general literature, etc., black. The subject of the plate is the little creeping plant represented on the background behind the panel and monogram; it is the fragrant lowly-growing flower which Linnæus selected to commemorate his name, the *Linnaea borealis*, of Gronovius, and it was sketched, one-half the natural size, from plants growing in the pine woods of Castle Grant, at Grantown, Morayshire, Scotland. The same plant is adopted as the device of the Linnean Society. We reproduce the plate reduced to three-fourths its size.



Localities Wanted.—Will readers kindly inform me through Science-Gossip of all specimens of the following trees which are living in the British Isles: (1) the tulip-tree, of which there are trees at Kew Gardens and in Croydon Cemetery; (2) the maidenhair tree, of which there is a fine one in Kew Gardens, and also, I am told, in the Terrace Gardens at Richmond, Surrey.—*E. A. Martin*, 69, *Bensham Manor Road, Thornton Heath.*

Pied Flycatcher in Yorkshire.—While trout-fishing last week on a stream in the neighbourhood of Kirby Moorside, in North Yorkshire, I saw a male bird of this elegant species on more than one occasion. From the behaviour of the bird, and the fact that it was always seen about the same spot, I have no doubt that its mate was nesting near, though I made no search for it. The kingfisher was also to be seen speeding its arrow-like flight up and down the same stream, a welcome and not too common treat for the eyes of any bird-lover. — *V. B. Crowther-Beynon, The Grange, Edith Weston, Stamford; May 23rd.*

Tenacity of Life in a Bee.—I received a number of shells of *Helix nemoralis* from a lady conchologist friend which were collected at Jesson, near Dungeness, at the beginning of last November. They came to me at the commencement of January, and about the end of that month I put them all in a glass-topped box. On May 14th among these shells I found a bee feebly crawling about. After feeding it with Demerara sugar and water and with honey, it gradually gained strength. Its long fast weakened it considerably, but on May 17th it left the open box and has not appeared since. It has had no food probably since the commencement of November, certainly not since the end of January up to May 14th.—(*Rev.*) *R. Ashington Bullen, Loughrigg, Somers Road, Reigate.*

Baron von Mueller's Correspondence.—Botanists throughout the world, but more especially the numerous personal friends of the late Baron Sir Ferdinand von Mueller, K. C. M. G., F. R. S., Government Botanist of Victoria, will be pleased to hear that his executors, the Rev. W. Potter, Dr. Alex. Buttner and Mr. H. Buttner, are now collecting donations for the erecting upon his grave in the St. Kilda cemetery, Melbourne, of a monument worthy of the deceased savant's fame. The monument is of grey granite, twenty-three feet in height, all highly polished, and will stand in the centre of a grave-plot twelve feet square, planted out with choice specimens of the Australian flora, with which the late Baron's name has become imperishably linked. They also will be glad to know that the illustrious phytologist's supplemental volume of the "Flora Australiensis," upon which he had worked for years, and was preparing for the press at the time of his death, is to be published, together with two volumes on his administration as Director of the Botanical Gardens, Melbourne, and embracing a biography and complete bibliograph of his writings. The executors will feel favoured by the loan of any of his letters, or the communication of incidents in the Baron's life which friends may deem worthy of notice in the biography. Donations and letters should be addressed direct to myself.—*Rev. W. Potter, "Vonmueller," Arnold Street, South Yarra, Melbourne, Australia.*

Whales at South Kensington.—The new department for the Cetacea at the Natural History Museum, Cromwell Road, will shortly be ready for public inspection, and forms an important addition.

Professor Michael Foster, M.B., D.C.L., D.Sc., LL.D., F.R.S., will be nominated by the Committee of the British Association at the Bristol Meeting in August next, for the presidency in 1899, when Dover will be visited.

The Borough of Southport has entered on the enlightened course of establishing an important meteorological station for investigation of the climatic conditions of the district. There is already a similar station at Eastbourne.

The Cluster 13 Messier, in the constellation Hercules, R.A. 16h. 38m., Dec. N., 36° 39′, which on a good night can be seen sparkling with even a 3-inch telescope, is said to contain 723 stars, as counted on a photograph.

Messrs. W. Brendon and Son, of Plymouth, have published "Data-forms for Egg Collectors"; they are arranged for name, collector, locality, date, remarks, etc. Bound in books of one hundred forms they are sold for 1s. 3d. each, post free.

The annual report for 1897 of the Scarborough Philosophical and Archæological Society, with which is associated the local field naturalists' and photographic societies, shows a promising awakening of interest in the neighbourhood in subjects scientific.

The Yukon goldfields are stated by Mr. William Ogilvie, of the Survey Department of Canada, to extend over more than 125,000 square miles of country. A system of thawing the frost-bound ground in winter by the aid of electricity has been invented.

Within a year, the Dublin Royal Zoological Society has lost by death two of its past-presidents. First, as already recorded, was that of Dr. Houghton, and on April 29th, there died Dr. Samuel Gordon, his successor, a physician of high standing in the Irish capital, and a former President of the Royal College of Physicians.

The "Report and Transactions of the Guernsey Society of Natural Science and Local Research for 1897" is to hand. It contains the President's address and various papers of more than local importance. One is especially so, on "The Plants of Sark," by Mr. G. T. Derrick, and another on "The Insects of Alderney," as is also that of Mr. E. D. Marquand, on "The Fungi of Guernsey."

Any special feature of the year at the first of the Royal Society's conversaziones, which took place on May 12th, could hardly be pointed out. Professor Oliver Lodge exhibited some experiments in space telegraphy. Mr. Campbell Swinton showed pinhole photography for Röntgen rays, Mr. Joseph Goold's experiments in relation to resonance were among those of physical interest; whilst Professor Poulton's Canadian insects in relation to European insects, Dr. Hans Gadow and Mr. W. F. Blandford's models of composition of the vertebræ in various Vertebrata; healthy and unhealthy oysters shown by Professors Herdman and Boyce, appealed to those interested in zoology.

We have received a reprint of a paper by Mr. Thomas Sheppard, of Hull, upon the Hessle Chalk Quarries. It is popularly written in view of inducing people to take an interest in the quarries.

The fine exhibition of photographic art and its accessories still being held at the Crystal Palace, is an object-lesson in its development. When we remember that the science has only been in existence for about half-a-century, its progress is indeed wonderful.

Paris has lost by the death of the Marquis de Cherville, at the age of 77 years, a writer on country-lore, of high ability and charming style. His weekly letters in the Paris "Temps" on rural life will be much missed. At one time the Marquis was a literary assistant to the elder Dumas.

We understand that Messrs. Jackson and Gurney, of Paternoster Row, are re-issuing the late William S. Dallas' work on "Elements of Entomology," which was originally published at 8s. 6d. The new issue should be a useful accessory within the reach of young naturalists, as its price is to be only 2s. 6d.

The total income of the Zoological Society of London for the year 1897 was £28,713, and the expenditure £25,329, exclusive of £2,375 spent during the year on new buildings. The number of Fellows was 3,158. The visitors to the Gardens reached, in 1897, the total of 717,755. The number of animals on exhibition on December 31st was 2,585, viz: 792 mammals, 1,362 birds, and 431 reptiles and batrachians.

The Vestry of Shoreditch, in London, has shown an enlightened policy in the application of science to the destruction of "dust" refuse collected in the district. The heat generated in their dust destructor with the consumption of less than a ton of coal per day, has supplied all the electric power for lighting the parish. During the nine months of operation, 491,107 units had been generated, which in addition to lighting the streets left a profit of £1,700 from private lighting. The interest on the capital outlay is six and a-half per cent. towards the reduction of the rates.

An immense stride has been taken during the past month in physical research, by Professor Dewar, through the liquefaction of hydrogen gas in appreciable quantities. In fact, this attainment, for it is hardly a discovery, when we remember how many other gases have been liquefied, will lead to further progress in research. The boiling point of liquid hydrogen is at about 240 degrees below zero centigrade, a point so intensely cold that atmospheric air becomes solid. Professor Dewar's system makes the production of the liquid form of this gas comparatively inexpensive.

Among the Queen's birthday honours we are pleased to note that Dr. John Murray, F.R.S., is to be a Knight Commander of the Bath, Civil Division. He was born in 1841, at Coburg, Ontario, his father being an accountant. Dr. Murray was one of the naturalists on board the "Challenger" from 1872 to 1876. Later he was first assistant of the staff for publication of the scientific results of the voyage, and then editor of the "Challenger Memoirs." Dr. Murray was also attached to the "Triton" and "Knight Errant" explorations. He is a specialist on marine deposits, a F.R.S., LL.D., D.Sc. and Ph.D.

CONDUCTED BY FRANK C. DENNETT.

	1898. June.	*Rises.* *h.m.*	*Sets.* *h.m.*	*R.A.* *h.m.*	*Position at Noon.* *Dec.*
Sun	1	3.49 a.m.	8.5 p.m.	4.38	22° 6′ N.
	11	3.45	8.14	5.19	23° 7′
	21	3.43	8.19	6.0	23° 27′

	June.	*Rises.* *h.m.*	*Souths.* *h.m.*	*Sets.* *h.m.*	*Age at Noon.* *d. h.m.*
Moon	1	4.36 p.m.	9.17 p.m.	1.22 a.m.	11 23 2
	11	12.11	5.58 a.m.	0.18 p.m.	21 23 2
	21	5.43 a.m.	1.53 p.m.	9.48	2 7 41

	June.	*Souths.* *h. m.*	*Semi Diameter.*	*R.A.* *h.m.*	*Position at Noon.* *Dec.*
Mercury	1	10.21 a.m.	3″ 8	3.1	13° 44′ N.
	11	10.37	3″ 1	3.57	18° 26′
	21	11.16	2″ 7	5.15	22° 56′
Venus	1	1.53 p.m.	5″ 7	6.33	24° 42′ N.
	11	2.7	6″ 0	7.26	23° 42′
	21	2.18	6″ 2	8.17	21° 35′
Mars	11	8.45 a.m.	2″ 5	2.5	11° 34′ N.
Jupiter	1	7.22 p.m.	18″ 1	12.4	1° 9′ N.
	11	6.44	17″ 6	12.5	1° 0′
	21	6.7	17″ 1	12.7	0° 44′
Saturn	11	11.6 p.m.	8″ 5	16.27	19° 48′ S.
Uranus	11	10.33 p.m.	1″ 9	15.54	20° 9′ S.
Neptune	11	0.7 p.m.	1″ 2	5.26	21° 56′ N.

MOON'S PHASES.

		h.m.			*h.m.*
Full	June 4	2.11 p.m.	*3rd Qr.*	June 11	6.4 a.m.
New	„ 19	4.19 a.m.	*1st Qr.*	„ 27	4.54 „

In perigee June 5th, at 4 a.m., distant 222,300 miles; and in apogee on 19th, at 2 p.m, distant 252,600 miles.

CONJUNCTIONS OF PLANETS WITH THE MOON:

June 4	...	Saturn*	7 a.m.	planet	5° 14′ N.
14	...	Mars*	12 p.m.	„	6° 17′ S.
17	...	Mercury*	10 p.m.	„	3° 50′ S.
22	...	Venus*	4 a.m.	„	3° 18′ N.
27	...	Jupiter*	3 a.m.	„	7° 3′ N.

* Below English horizon.

OCCULTATIONS AND NEAR APPROACH:

June	*Star.*	*Magnitude.*	*Disappears. h.m.*	*Angle from Vertex.*	*Reappears. h.m.*	*Angle from Vertex.*
4	σ Scorpii	3	2.52 a.m.	332°	Near approach.	
4	A Ophiuchi	4·7	Below horizon		9.11 p.m.	290°
5	λ Sagittarii	3·1	10.15 p.m.	105°	11.22 p.m.	293°

THE SUN'S surface is frequently showing a considerable amount of disturbance, though the spots themselves are usually small. On 21st, at 10 a.m., the sun enters Cancer, and summer is said to commence.

MERCURY is a morning star until its superior conjunction with the sun at 8 a.m. on 30th. At the beginning of the month it rises more than three-quarters of an hour before the sun, and on 12th it is about 7° directly south of the Pleiades. At 12 p.m. on 22nd Mercury is in conjunction with, and 1° 27′ north of, Neptune.

VENUS is an evening star all the month, not setting for at least about 2h. after the sun. On 12th it is a few degrees south of Castor and Pollux.

MARS is a morning star, rising about 2h. 52m. before the sun at the end of the month.

JUPITER is a splendid object if looked for as soon as it becomes visible. It sets about 1.40 a.m. at the beginning of the month and about 2h earlier at the end. Near η Virginis.

SATURN is a fine object, the Cassini division of his rings being visible with anything over two inches on a good night, with a power of 120; but the great south declination is antagonistic to definition. On June 9th the major axis of the outer ring is 42″·76, and the minor axis 18″·62, the polar diameter of the planet being 17″.

URANUS suffers from its great south declination, being a little south of β Scorpii, otherwise it is favourably placed for observation.

NEPTUNE being in conjunction with the sun at 7 a.m. on 13th cannot be observed.

METEORS may be specially looked for on June 6, 7, 22, 29 and 30.

THE RED SPOT ON JUPITER.—In a paper on "The Present Condition of Jupiter," contributed to "Nature" by Mr. W. F. Denning, he tells us that this object is still visible, but as a faint dusky ellipse with a light interior, and that it is connected on its south side with a grey belt. Comparing an observation by himself on April 17th, 1898, with F. C. Dennett's first observation, July 27th, 1878, he finds it has made 17,414 rotations in 7,203 days, with a mean rotation of 9h. 55m. 39·4s. This period is not, however, constant. From 413 rotations, September 27th, 1880, to March 17th, 1881, the period was 9h. 55m. 35·6s. From 495 rotations, August 15th, 1892, to March 8th, 1893, the period was 9h. 55m. 42.3s. Whilst from 514 rotations between September 27th, 1896, and April 25th, 1897, the resulting period is 9h. 55m. 40·8s.

PERRINE'S COMET *b*, 1898.—On June 1st its place will be R.A. 3h. 12m. 49s., and N. Dec. 56° 20′·5, its real distance from the earth being about 214,000,000 miles, whilst its brightness will have fallen to 0·22, that at its discovery being 1·0.

ENCKE'S COMET is due to pass its perihelion on May 24th, which is the anniversary of its perihelion passage in 1822, its first predicted return. M. Iwanow, of Pulkowa, computes that it will not be visible until after perihelion, and then only in the southern hemisphere. It will be nearest to the earth on July 7th, when its distance will be only 25,000,000 miles.

TEMPLE'S COMET (Comet II., 1867) is due this year, but may possibly not put in an appearance, as it has not been since 1879, though it should in the interval have made two returns, its period being only six and a-half years.

THE singular "nebula" mentioned as discovered by Rev. T. E. Espin, on p. 331 of last volume, is, according to Dr. Isaac Roberts, only an opening amongst the stars analogous to what Sir John Herschel would have called a "coal-sack."

MR. JOHN HIPPISLEY, who was elected a Fellow of the Royal Astronomical Society in 1849, and who contributed several papers to its "Monthly Notices," including a drawing of the great nebula in Orion made in Malta whilst assisting his friend the late Mr. William Lassell, has recently died at Bath, aged ninety-three years,

HAS THE MOON AN ATMOSPHERE.—In the paper in last month's number, p. 339, column 2, line 6 below block, omit "on"; p. 340, column 1, line 2 from bottom, for *Pice* read *Pico*, and column 2, line 15, for Bert read Birt. These corrections are necessary through a miscarriage of Mr. Dennett's proof.—J.T.C.

CONTRIBUTED BY FLORA WINSTONE.

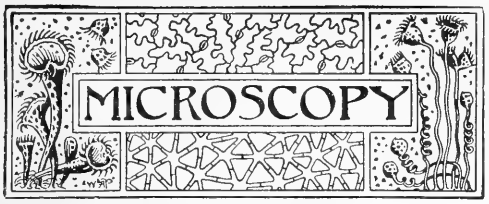
La Nature (Paris, April 30th) contains an account, by M. L. P. Clerc, of a new invention for determining the exact position of any foreign substance in a human body. The machine, which comes under the head of a radiometer, was presented to the Medical Academy at Paris by Dr. G. Mergier. The method of working is shown by five illustrations. In the number of May 7th, M. Henri de Parville, the editor of the magazine, describes some excursions proposed under the auspices of "La Nature." These excursions are to take place under the direction of a gentleman of recognized authority in science. They are formed with the object of visiting beautiful places, natural curiosities, mines, etc., of France, and to give opportunities of studying the geology, fauna, flora, hydrography, etc., of different regions. This year it is proposed to visit Decazeville, Figeac, Aurillac, Vic-sur-Cère, Murat, Saint-Flour, the viaduct of Garabit, Mende, the Falls of Tarn, Meyriceis, Mount Aigoual with its observatory, Vigean. The excursion will start early in August, and will be under the direction of M. Marcellin Boule, the well-known geologist of the natural history museum at Paris, who is thoroughly conversant with Central France, the object of the first excursion. In the same number M. E. Deshaves continues his description of the Musée D'Ennery, a Japanese collection presented to the nation by Madame D'Ennery, who has personally collected most of the exhibits. A singular tree, discovered by M. Edouard Blanc during his eastern voyage, is fully described, with two illustrations by M. J. Poissons. This strange growth is called Saxaoul, the botanical name being *Hadoxylon ammodendron*. It is found in the south-east of Russia on the Steppes, on the borders of the Caspian Sea, in Persia, and even in Siberia. The writer says that its form is so strange it may well have inspired Callot and Gustave Doré with the idea of the plants of the infernal regions. M. Zaborowski writes on the Neolithic haunts on the borders of the Seine, giving illustrations of the flint instruments, and also a photograph of a pit or cave in which instruments of a similar character were found. Commandant G. reviews from a technical point of view the naval forces of Spain and America, dealing in this number only with the American vessels. (May 14th.) M. E. Hospitalier gives an account of a successful experiment in liquefying oxygen recently made by Dr. Linde, of Munich, who has succeeded without having to use any other agents for freezing than air. M. P. Yvon writes on calcium carbide, more especially the amount of absolute alcohol to be obtained from it. Mr. Hart, the Superintendent of Botanical Gardens of Trinidad, has recently been making some experiments and observations in the fertilization of flowers by field mice. The results are related in this number by M. H. Coupin, especially those relating to *Bauhinia magalandra*. This tree flowers in January and a short time after the buds open field mice may be seen running from one flower to another. After one of these little animals has visited a flower the white petals fall to the ground and by the following morning there will not be a single blossom left intact. It is supposed that the mice are searching for insects, and fertilize the flowers while doing so by carrying the pollen from bloom to bloom.

Cosmos (Paris, April 30th). This number contains an article on the "Physical State of Mars," by Lieut.-Col. V. du Ligondès, in which he shows by various arithmetical problems that the heat on Mars on a summer's day is not equal to the warmth of winter here. M. Jaques Boyer contributes some notes with portrait on the work of Aimé-Charles Girard, the celebrated agricultural chemist, who died in April last.

Bulletin de la Société Philomatique de Paris (Paris, Nos. 1-2, 1898). These numbers contain a long and very interesting article by M. E. L. Bouvier, Professor at the Natural History Museum, Paris, upon the "Classification, Origin and Distribution of the Crabs of the Family Dorippideae. It deals with their characters and classification, including a table of particulars, their affinities—more especially with the group Dromia; and there is added a family tree and the species already known; there is also a table of the distribution, suggesting the original centre, and an appendix. Dr. Jousseaume describes the specimens of Triphoridae that he collected from the Red Sea. This article includes amongst those he believes to be new species, *Inella perimensis*, *Mastonia moenades*, *M. iniqua*, *Obesula senilis*, *Virola morychus*, and several others. The remainder of this number is occupied by some unfinished malacological notes, by M. Jules Mabille, on slugs and shells from various countries, in which he describes several new species.

Nautilus (Philadelphia, August, 1897, to April, 1898). We have received a reprint of a series of papers which came out in the above magazine, being a classified catalogue with localities of the land-shells of America, North of Mexico, published by Henry A. Pilsbry and Charles W. Johnson, the editors of "The Nautilus." This is simply a useful catalogue with localities, but of course no descriptions. From it we find that there are 375 species. There is no introduction, as the authors commence at once with the scientific arrangement, each species being followed by the district in which it has been discovered. The list forms an excellent reference work, independently of its use as indicating the geographical range of different species.

The Pterophoridae of North America.—A report of the Massachusetts Agricultural College (January, 1898) is devoted to a monograph of the plume moths of the North American Continent. It is by Dr. C. H. Fernald, A.M., Ph.D., and illustrated by nine plates of drawings of anotomical studies, including the body, legs, wings and genitalia of different species. The monograph commences with some general notes on geographical and geological distribution, the economic importance of this group in regard to the injuries caused by their larvæ to plants and flowers, the natural enemies of the plume moths, a history of the literature of the subject, structure, habits, etc. Then follows a synopsis of species, with synonomy and technical descriptions of genera and species. It is a most useful paper and one which cannot fail to attract the attention of European lepidopterists for comparative studies.



CONDUCTED BY J. H. COOKE, F.L S., F.G.S.

To whom Notes, Articles and material relating to Microscopy, and intended for SCIENCE-GOSSIP, *are, in the first instance, to be sent, addressed "J. H. Cooke, Edlestone, Battenhall Road, Worcester."*

CHANGE OF ADDRESS.—Mr. Cooke's address in future will be: Edlestone, Battenhall Road, Worcester.

MESSRS. ROSS, LIMITED, have issued quite a number of interesting new catalogues. We have received a bundle of five of these, including their price list for 1898. The latter little book is also translated into the Spanish, and issued especially for the country of Spain.

THE MICROBES OF PARIS.—According to M. Miquel, of the Paris Municipal Observatory at Montsouris, the air of Paris contains an average of 7,620 bacteria per cubic metre. In summer it increases to 9,685, and in winter is only 4,020. The air of the sewers appears to be privileged, and contains only 2,500 per cubic metre, while heat and cold do not affect it. He explains that his figures are much higher than those of other bacteriologists, as by his system he can only count his colonies fifteen days after taking his samples, while the general rule is to count them after three or four days. M. Miquel considers that his process is the right one.

THE MICROSCOPE AND MICROSCOPICAL METHODS. —The sixth edition of this standard work on microscopy, by Professor Simon H. Gage, of Cornell University, well deserves the high popularity to which it has attained in America. The work has been practically rewritten and greatly enlarged; and it is now illustrated by 165 figures in the text. It marks the effort of a practical teacher, the author's method of treatment being broad and educational to a degree. As a book of reference on up-to-date methods in manipulation and technique, it is invaluable for every working microscopist, and we therefore cordially recommend it to our readers. It is published by the Comstock Company, Ithaca, New York.

THE JOURNAL OF APPLIED MICROSCOPY is a monthly publication recently started by the Bausch and Lomb Optical Company of Rochester, New Jersey. To those who have neither the time nor the opportunity to make themselves acquainted with the most modern aspects of microscopical technique this journal will be invaluable. Its third number contains articles on "Methods in the Study of Mature Seeds," notes on "Microscopical Technique," "Mitosis," illustrated by photo-micrographs, "Wheat-flour in Ground Ginger," and several others descriptive of apparatus and methods. It also contains a "Notes and Queries" column and abstracts of the more important of the recently issued papers on microscopical research. The annual subscription to the paper is one dollar, and the London publishers are Messrs. Dawbarn and Ward, Limited, 6, Farringdon Avenue, E.C.

WEATHER LORE.—It is readily understood, seeing how much affected is mankind by weather conditions, that dense superstition and many quaint saws have crept into the daily thought of country folk. Neither are such confined to them, if we may judge from the issue of a third edition of "Weather Lore," by Mr. Richard Inwards, F.R.A.S. (London: Elliot Stock, 1898). It is a most entertaining collection of weather knowledge, tradition, proverbs, folk-sayings, wise saws and rhymes. In this edition the subject is much extended, and it is difficult to discover the omission of any quaint reference to weather that one has ever heard. The following quotations from Mr. Inward's book will be interesting to some readers. Bacon says: "The sound of church bells is supposed to dissipate thunder and lightning." Church bells are still rung in the Austrian Tyrol with this object. Arago says, in the prayers at the blessing of church bells according to the Paris ritual, occurs this sentence: "May the sound of this bell put to flight the fiery darts of the enemy of man, the ravages of thunder and lightning, the rapid fall of stones, the disasters of tempests." It sometimes happens that what were considered superstitions are well founded on fact. For instance, writing in 1723 in his book, "A Rational Account of the Weather," John Pointer says that "flashes of lightning follow in the same track; the reason being, the first flash rarefies the air and makes a path for succeeding ones." Without entirely granting his reason, the fact is proved by modern photographs that flashes of lightning are often in double and triple parallels. That animals are affected by coming weather changes there is little doubt; in fact, this is a subject too much neglected by observant naturalists, and is one that would well repay attention. Some of the popular beliefs are worth noting. When a cat sneezes, it is said to be a sure sign of rain; when she scratches a wall or post, wind may be expected; and a thaw in frost if she persistently washes her face; she is said to sit with her back to the fire before snow. Dogs eating grass portends rain, and if they howl much, men may look out for a storm. If horses stretch out their necks and sniff the air, rain will ensue. I have sometimes myself noticed in thundery moist weather that standing horses will stamp the ground with their feet. At times this is observable along a cab-rank, when the noise of the stamping will attract attention. Flocks of goats graze down the mountains preceding the approach of a storm, and upwards before fair weather. I hardly think animals which hibernate can foretell whether a winter will be mild or severe. Still, such is the opinion of country folk. If moles make a large or small provision of worms, or squirrels a corresponding store of nuts, they say the winter will be mild or severe in proportion. Bats uttering plaintive cries, or flying into the house, indicates rain. Such are some of the multitude of weather saws in the 240 pages of this charming book.—*Flora Winstone, Epping, Essex.*

GEOLOGY

CONDUCTED BY EDWARD A. MARTIN, F.G.S.

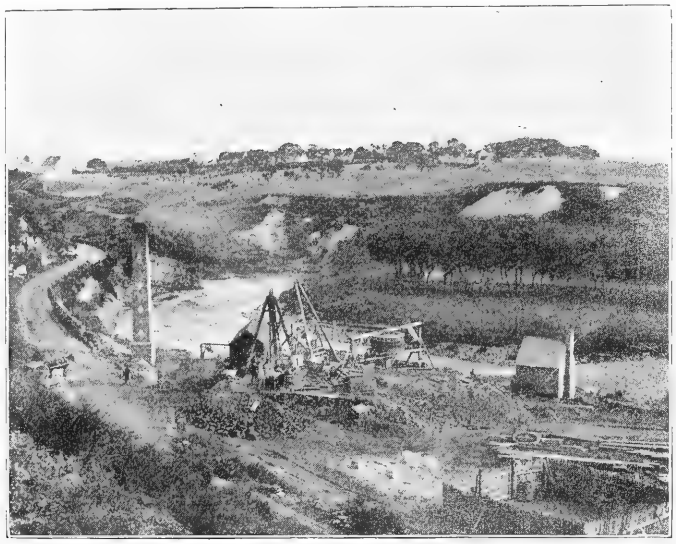
To whom all Notes, Articles and material relating to Geology, and intended for SCIENCE-GOSSIP, *are, in the first instance, to be addressed at* 69, *Bensham Manor Road, Thornton Heath.*

ROCKS OF SUTHERLAND AND CAITHNESS.—The history of the rocks of Sutherlandshire and Caithness is traced out in a popular and acceptable fashion in H. M. Cadell's "Geology and Scenery of Sutherland" (David Douglas, Edinburgh). Without entering too deeply into the great controversy over the age of the Eastern Schists, the main conclusions are shown in pleasing style. By the kindness of the publishers, we are enabled to reproduce two of the many excellent illustrations which are to be found in the book. The first represents the peak of Suilven or the "Sugar Loaf," composed of horizontal courses of Torridon Sandstone (pre-Cambrian) and standing "like a giant sentinel in a heaving sea of gneiss." It is about 2,400 feet high. The conglomerates and breccias of this formation rest immediately upon the Archaean gneiss, passing up into grits and fine-grained sandstones. Evidence is not wanting of effects of the glacial plough in Sutherland. On the west the boulder-clay has been all but swept away, but the hummocky ice-worn gneiss of the west is shown well in the illustration. The boulder-clay is only found in any quantity in the lower eastern districts, where also perched blocks and morainic mounds both testify to the effects of the Glacial period here. Along the eastern seaboard is a narrow tract in which Middle Lias (400 to 500 feet), Lower (120 feet), Middle (400 feet), and Upper Oolites (1,000 feet), extend from Golspie to the Ord of Caithness. The shales and sandstones of the Lias are full of plant remains, sometimes forming thin layers of vegetable matter. It is, however, the contents of the succeeding Lower Oolite which have rendered these Secondary beds famous. The shales become increasingly carbonaceous, until finally the coal-seam of Brora is reached at their summit. Mr. Cadell states that its existence was known as early as 1529. The maximum thickness of the seam is $3\frac{1}{2}$ feet, and is divided into two parts by a layer of iron pyrites about six inches thick. In places it seems to be made up of the crushed stems of *Equisetites columnaris*, and, unlike the coal-measure seams, is made up of drifted vegetable remains, spread out as a true aqueous deposit over the sea-bottom. The other illustration shows the Brora coal-pit, from which, according to Lyell, upwards of 80,000 tons of coal had been extracted.

PEAK OF SUILVEN, WITH ICE-WORN GNEISS IN FRONT.
(*From Cadell's "Geology and Scenery of Sutherland."*)

GEOLOGY OF LLANDUDNO.—At the meeting of the Geological Society, on May 4th, a paper was read by Mr. G. H. Morton, F.G.S., on "The Carboniferous Limestone of the Country around Llandudno." The Carboniferous Limestone from Llangmynech to Prestatyn, and around the Vale of Clwyd, Abergele and Llanddulas, shows well the subdivisions of "Lower Brown," "Middle White," and "Upper Grey," along the whole distance. At Llandudno the precipitous Great Orme's Head presents fine sections of the Carboniferous Limestone, and these subdivisions may be easily examined in a continuous series of cliffs, ridges and

quarries. The entire succession is, however, not perfect, for the highest beds of the "Upper Grey Limestone" have been denuded, and at the Little Orme's Head are altogether absent. Copper lodes on the Great Orme's Head appear to have been worked by the Romans, and again in recent years until abandoned fully thirty years ago. Some of the lodes are faults. It is to the undulation of the Limestone that the ever-varying dip of the beds is attributed. Numerous fossils occur in the "Upper Grey Limestone," and a few are peculiar to the subdivision and the locality, but of these only a single specimen of each has been found. *Productus margaritaceus* is abundant, though only an occasional species in other localities, and is not found at a lower horizon anywhere else in North Wales. Other species, as *Orthis michelini*, formerly supposed to be peculiar to the "Upper Grey Limestone," have been found at the base of the "Middle White Limestone," at the Flagstaff Quarry on the Marine Drive, near the Happy Valley. The Jeffreys and by Mr. S. V. Wood, and its contents were afterwards worked out by Messrs. Kendall and Bell. About a hundred species have been obtained thence, mostly mollusca. The deposit stands about 100 feet above ordnance datum, and dips about 5° to north-north-west. In one section it shows yellow sand and clay, blue clay, and fine quartzose sand, of which, however, the blue clay alone is fossiliferous. The evidence of the molluscs seems to show the deposit to be of Middle or Lower Red Crag age. Among characteristic mollusca which occur are *Littorina subaperta, Conovulus pyramidalis, Nassa granulata, Columbella sulcata, Nassa reticosa* and *Turritella incrassata*, together with others of a southern character, such as *Fusus corneus, Nassa mutabilis, Cardium papillosum* and *Cardita aculeata*. Four species of polyzoans were met with, common to the Coralline Crag and the Italian Pliocenes, fragments of *Balanus*, and several swimming crabs, detached plates and spines of *Echini*, three or four species of annelids,



View of Coal-Pit at Brora, Caithness.
(*From Cadell's "Geology and Scenery of Sutherland."*)

dolomitization of the Carboniferous Limestone is remarkable, and almost peculiar to that around Llandudno, though it also occurs at Penmon in Anglesey. The "Lower Brown Limestone" has been almost entirely converted into dolomite and portions of the overlying sub-divisions. The filling of the faults has often been changed into dolomite, and the alteration of the limestone is generally in a very capricious manner. In the discussion which followed, Professor Sorby made some interesting remarks on attempts which he had made to artificially produce dolomitization of carbonate of lime. He had, however, only been able to produce pseudomorphs in carbonate of magnesia, but not the two combined as dolomite.

Pliocene Deposit in Cornwall.—At St. Erth, in Cornwall, is a very interesting deposit, of Pliocene age, in the shape of certain sands and clays which have been exposed on the glebe-land belonging to the vicar of the parish. Attention was called to it some years ago by Dr. Gwyn spicules of calcareous sponges, plates of Holothurians, and minute stellate calcareous spicules of one of the Tunicata, closely allied to *Leptoclinum tenue*. From consideration of the fauna, the conclusion has been arrived at by Jukes-Browne and others that the Arctic and the Atlantic Oceans were then disconnected, by reason of an isthmus running across from Europe to America. This connection probably continued from Eocene to early Pliocene times.

Fossil Ivory.—The quantity of fossil ivory which has been, and is still being, transported from Siberia to the markets of the world, seems almost incredible. Middendorf calculated that not less than 110,000 pounds of tusks and teeth are collected every year, representing at least 1,000 individual mammoths. At this rate, during the last thirty years, the remains of 30,000 mammoths have been used up. By the middle of the eighteenth century the trade commenced to assume considerable proportions, large stores being dis-

covered in 1750 by Liachof. In 1821 one trader from Yakutsk alone brought from New Siberia 20,000 lbs. of ivory, each tusk averaging 120 lbs. The whole northern sea-board, from the Ural Mountains to the Behring Straits, is rich in these fossil remains, but the most famous deposits are those in the archipelago, which is known by the name of the merchant Liachof. When the bones contain still a quantity of fat, they are used for fuel. The occurrence of flesh and hair on the bones is a very familiar fact, and it is an interesting point, as urged by Brandt, that the mammoths have frequently been found standing upright in the ground, as if they had sunk in the soft soil, and were afterwards frozen in. Associated with them have been found Helices, and other landshells of a more southern aspect.

THE LENHAM BEDS.—In 1857 the late Sir Joseph Prestwich announced the discovery of a curious ironstone deposit at Lenham, on the North Downs, in which occurred shells of Pliocene age. Their age was disputed at the time by some geologists, but the Lenham beds have since come to be regarded as undoubtedly of Pliocene age. The beds occur at a height of over 600 feet above sea level, to the south-east of Maidstone. They were examined at various times by Mr. Clement Reid, on behalf of the Geological Survey, and in 1886 some blocks of fossiliferous ironstone were obtained from pipes in the chalk, this being the mode of occurrence of the original specimens. Impressions were taken from the moulds of the fossils, and by this means a series of casts were obtained, which on examination showed a complete corroboration of Prestwich's view, that the deposit was of Pliocene age. Amongst the better known Pliocene fossils that occurred were: *Pyrula reticulata, Nassa prismatica, Trophon muricatus, Turritella incrassata, Trochus millegranus, Cerithium, Natica, Pectunculus glycimeris, Arca, Leda, Nucula, Cardium, Cardita senilis, Tellina, Mactra,* and *Balanus*. Mr. Reid referred the beds to the older Pliocene period, correlating them with our Coralline Crag, and the Lower Crag, or Diestian, of Belgium, and possibly also with the St. Erth beds in Cornwall. The shells appeared to be in an undisturbed position, unworn, and generally with their valves united. If we allow that the deposit was formed with only twenty or thirty fathoms of water over the highest parts of the South Downs, then it would follow that almost the whole of the south and east of England must have been submerged during this period. The position of the Lenham beds shows that the Thames and Wealden Valleys have been to a large extent excavated since Pliocene times.

A PAPER by Miss G. L. Elles on "The Graptolite-Fauna of the Skiddaw Slates," was read at the meeting of the Geological Society on May 4th. The complete list of graptolites comprised twenty-two genera and fifty-nine species. Miss Elles explained the remarkable resemblance between the species of various genera by supposing that the forms in question are the results of development along certain lines. In dealing with the phylogeny, she divided these graptolites into two groups (1) those derived from a *Bryograptus* form (2) those derived from a *Clonograptus* form. To the first group belong fifteen named graptolites from the Skiddaw Slates and four species from other localities; and to the second group twelve Skiddaw species and two others.

C. H. HURST.—The death is announced of Dr. C. H. Hurst, formerly engaged in the Zoological Department of Owens College, Manchester, and latterly Lecturer in Zoology at the Royal College of Science, Dublin.

J. S. HYLAND.—Among the recent victims to the climate of West Africa is Dr. J. S. Hyland. He was only thirty-two years old and an accomplished geologist. He was educated at Crosby, near Liverpool, and took his degree of Ph.D. in mineralogy and science with honours at Leipsic. Dr. Hyland was connected for a couple of years with the Geological Survey of Ireland. He has worked also in Alabama and Tennessee. At the time of his death he was engaged in similar occupation in Ashanti, where he went in March last. This was not his first visit to that continent, where he had served as geologist to an exploring expedition, but was invalided home. He was a F.G.S., and since his death, we believe, though the fact was not known at the time, Dr. Hyland has been elected a Fellow of the Chemical Society.

EDWARD WILSON.—The city of Bristol has lost a faithful servant by the death of the late Edward Wilson, F.G.S., who was for fourteen years Curator of the Bristol Museum. He died on May 21st at the age of forty-nine years, after three weeks' illness, through renal complications. Mr. Wilson was unsparing in the trouble he took to improve the museum, and it was largely through his influence that the geological section has been much enriched in latter years. Only at the beginning of this year was commenced the entire re-arrangement, under his supervision, of the zoological collections. As a practical geologist Edward Wilson was well known in the West of England, and even up to the last month of his life he was engaged in investigating the Uphill Cave deposits near Weston-super-Mare. From that site a large collection of mammalian remains and some worked flints have been acquired by the Bristol Museum through his exertions. Mr. Edward Wilson was born at Mansfield, Nottinghamshire, and was the eldest son of a well-known medical practitioner, Thomas Wilson, of Nottingham. He was educated at the High School of the latter town, and at the age of fifteen won the Mayor's prize at his school with an essay on the "Coalfields of Derbyshire." He matriculated at the London University, and for fourteen years was engaged with the Government classes at Nottingham Mechanics' Institute as a teacher in Biology, Geology and Palæontology. He has published numerous papers in the "Quarterly Journal of the Geological Society," the "Geological Magazine," "Proceedings" of the Bristol Naturalists' Society, and of the British Association; the Council of the latter Society having once awarded him a grant to assist in his investigations. At the time of his death Edward Wilson was preparing a Monograph of the British Liassic Gasteropoda for the Palæontographical Society of London. He was local Honorary Secretary for the Geological Section for the British Association Meeting to be held at Bristol next September.

SOUTH-EASTERN UNION OF SCIENTIFIC SOCIETIES.

THE third annual Congress of the Union of Scientific Societies for the South-East of England will be held in the town hall at Croydon, on June 2nd, 3rd and 4th, under the presidency of Professor G. S. Boulger, F.L.S., F.G.S. The union has now affiliated twenty-nine societies, including four in London, six in Surrey, four in Sussex and fifteen in Kent. They are City of London Ent. Soc., City of London Coll. Sc. Soc., North London Nat. Hist. Soc., South London Ent. Soc.; Balham Antiq. and Nat. Hist. Soc., Croydon Micro. and Nat. Hist. Club, Croydon Camera Club, Reigate Nat. Hist. Soc., Sutton Nat. Hist. Soc., Working Field Club; Brighton Nat. Hist. Soc., Eastbourne Nat. Hist. Soc., Hastings Nat. Hist. Soc., Horsham Nat. Hist. Soc.; Bromley Naturalists' Soc., Catford Nat. Hist. Soc., Dover Nat. Hist. Soc., East Kent Nat. Hist. Soc., Folkestone Nat. Hist. Soc., Maidstone Nat. Hist. Soc., New Brompton Naturalists' Club, North Kent Nat. Hist. and Sc. Soc., Rochester Nat. Hist. Soc., Sidcup Lit. and Sc. Soc., Southborough Field Club, Tunbridge Wells Amateur Photographic Soc., Tunbridge Wells High School Nat. Hist. Soc., Tunbridge Wells Nat. Hist. Soc., West Kent Nat. Hist. Soc.

According to present arrangements, at 8 p.m. on Thursday evening, June 2nd, the President will deliver the annual address. On Friday morning there will be a council meeting at 10 o'clock, and the general meeting at the town hall, from 11 a.m. to 1 p.m., when papers are down for reading by J. W. Tutt, F.E.S., on "Entomology as a Scientific Pursuit"; by C. Dawson, F.G.S., F.S.A., on "Ancient and Modern Dene Holes and their Makers"; and the "Folk-lore of Amulets and Charms," by E. Lovett. On Friday afternoon from 3 p.m. to 5 p.m., the papers to be read are on "The Place of Geology in Education," by Professor Logan Lobley, F.G.S., F.R.G.S., "The Nature of Soil in Connection with the Distribution of Plants and Animals," by H. Franklin Parsons, M.D., and "Natural Gas in Sussex," by C. Dawson, F.G.S., F.S.A. On Friday evening the Mayor of Croydon will give a reception, when there will be short addresses, with lantern illustrations, on "Photography in Relation to Science," by J. H. Baldock, F.C.S., "Life-history of the Tiger Beetle," by Fred Enock, F.L.S., F.E.S., and on "New Methods of Preparing Fossils," with demonstrations, by Arthur W. Rowe, M.B., M.S. On Saturday morning the delegates will meet for business at 10.30, and at 11.30 the General Meeting will take place, the discussions being led by various members on "Ideals for Natural History Societies and How to Attain Them" and "Botanical Work Still Wanting." On the afternoon of Saturday at 3 o'clock excursions will be conducted to Beddington and neighbourhood, by Dr. Parsons, and to Addington and district by Dr. Hobson. During the meeting a temporary museum will be formed by loan exhibits, arranged by the local committee, relative to Croydon and its neighbourhood. Several influential local and general committees have been formed, and there appears every likelihood of a successful meeting. Members of the affiliated societies can join the meeting by payment of 2s. 6d., and others for 3s. 6d. The Hon. General Secretary is Dr. G. Abbott, of Tunbridge Wells, and the Hon. Local Secretary is Dr. C. Poulett Harris, 75, Morland Road, Croydon.

THE SOUTH LONDON ENTOMOLOGICAL AND NATURAL HISTORY SOCIETY.—March 24th, 1898. Mr. J. W. Tutt, F.E.S., President, in the chair. Mr. Adkin exhibited specimens of *Grammesia trigrammica (trilinea)* in which the ground colour was so darkened as to obliterate the usual transverse lines. These were known as the Lewis form. Mr. Moore, a pale pigmented variety of *Anosia menippe (archippus)* from the Malay Archipelago. It was noted that such a variation of this species was hitherto unknown. Mr. Cant, a series of strongly-marked specimens of *Hybernia defoliaria* from Dean Forest, and a dark costal form specimen of *Xylocampa conspicillaris* from Worcester. Rev. J. W. Horsley, a large number of land and freshwater shells from all parts of the world, especially of the Helices, and gave a most interesting address, entitled, "A Chat on Snails." —April 14th. Mr. R. Adkin, F.E.S., Vice-President, in the chair. Mr. Harrison, a number of living specimens of a Coleopteron from Bombay. It was a species of the *Cassida* group and looked like a piece of pure gold. It was stated that this appearance was lost after death. Mr. South, on behalf of Rev. A. Snell, a curious specimen of *Leucania littoralis* having darkened hind wings; specimen of *Leptogramma ferrugana* and *Cerostoma radiatella* taken this spring at Oxshott, having hibernated. Mr. Barnett, a living specimen of viper from the New Forest. Mr. Ashby, specimens of the spring-tail, *Machilis polypoda*, taken under wood and stone in the New Forest. Mr. Adkin, various specimens of the Tephrosias. Mr. South, and Mr. McArthur both gave details of the occurrence of very closely allied forms in Japan and Assam. Mr. South, a large number of specimens of Japanese lepidoptera kindly lent by Mr. Leech to illustrate Mr. South's paper, entitled, "British species of Lepidoptera occurring in Japan."—April 28th. Mr. R. Adkin, F.E.S., Vice President, in the chair. Mr. Bishop exhibited a very varied series of bred *Taeniocampa miniosa* and remarked that a large proportion of the brood had the claws of the front legs undeveloped, and were thus unable to cling to vertical surfaces. Mr. Lucas, specimens of the plant snakes-head (*Fritillaria meleagris*) from fields near the Thames at Oxford, where it was abundant. Mr. Sauzé, a series of *Brachinus crepitans* from Swanage, very variable in both size and colour. Mr. Edward Saunders sent a series of Hemiptera Heteroptera, comprising examples of most of the genera of this group to illustrate his paper. Mr. West (Greenwich), a drawer comprising a large number of Hemiptera taken by himself during the last three years. Mr. Adkin, a series of bred *Eugonia quercinaria*, including a gynandromorphous specimen, together with mounted examples of the genitalia and enlarged photographs of the same, and read detailed notes. A paper written by Mr. Edward Saunders, F.L.S., entitled "Notes on Collecting British Hemiptera," was then read.—May 12th. Mr. J. W. Tutt, F.E.S., President, in the chair. Mr. Adkin exhibited red specimens of *Cidaria unidentaria*, and Mr. Tutt said

there was no doubt as to this form occurring in the species, as it had recently been bred. Mr. Moore, specimens of *Anasa tristis* (the squash bug), *Murgantia histrionica* (the harlequin cabbage-bug), *Anophthalmus tenuis* (a blind cave-beetle), and *Blissus leucoptenis* (the clinch-bug), all from the United States of North America; and contributed notes. The blind beetle was from the famous Wyandotte caves. Mr. Winkley, a variety of the slug *Arion ater*, of a beautiful red flesh-colour instead of the typical black, It was found by Mr. Frohawk in a wood to the south-east of Croydon. Mr. Lucas, specimens of the marsh violet, *Viola palustris*, from Oxshott. Mr. Albert Jones, a very large number of European lepidoptera, mostly bred, and in the finest condition, to illustrate his paper on the subject of "Collecting in the Riviera." Mr. Tutt and Dr. Chapman gave details of their recent experiences in the district.—*Hy. J. Turner, Hon. Report. Sec.*

North London Natural History Society.—Thursday, March 17th, 1898. Mr. R. W. Robbins, President, in the chair.—Exhibits: Mr. Bear, specimens of *Dermanyosus avium*, which attacks cage birds, causing them to lose their feathers, found in the cracks of the cage doors, etc., where it hides during the day. Various accounts were given of the sallows, which appeared to be not yet out in Epping Forest, out here and there at Broxbourne, and about half out at Winchmore Hill. Mr. Austin announced that he and Mr. Harvey had found daffodils in the old locality at Cheshunt last Sunday. Mr. C. Nicholson opened a discussion on "Nebulæ." Previous to the invention of telescopes, only one of these objects appears to have been recognized, namely, the Great Nebula, in Andromeda, which was known at least as early as the tenth century. The Orion Nebula was first mentioned by a Swiss Jesuit, Cysatus, in 1681. The earliest catalogue was made by Messier in 1781, and Herschel's catalogues of 2,500 Nebulæ appeared some years later. Herschel was the first to suspect a distinction between true nebulæ and clusters of stars. The distinction has been subsequently shown by Dr. Huggins with the spectroscope. The spectrum of a star, and therefore of clusters, is a continuous band of coloured light, crossed by numerous dark lines; that of a nebula is not continuous, but consists only of some half-dozen bright lines. The Andromeda Nebula, and that in Canes Venatici, are not true nebulæ, as their spectra are continuous. True nebulæ are generally considered to consist of vast masses of glowing gases, and hydrogen is almost universally present.—*Lawrence J. Tremayne, Hon. Sec.*

Royal Meteorological Society. — The monthly meeting of this Society was held on Wednesday afternoon, May 18th, at the rooms of the Royal Astronomical Society, Burlington House, Mr. F. C. Bayard, LL.M., President, in the chair. Mr. R. H. Scott, F.R.S., read a paper on the "Frequency of Rainy Days in the British Islands." He had taken the number of rainy days in each month at forty stations for the twenty years 1876-95, and then divided that number by the total number of days in the month, and so ascertained the resulting percentage. The greatest excess of frequency is always on the extreme north and west coasts. June is the month with the least number of rainy days, but in July the summer maximum of rain occurs, bringing the well-known Lammas floods. In October the weather becomes decidedly showery, and the distribution begins to assume its winter type. November is the month with the greatest frequency of rainy days. Mr. F. J. Brodie read a paper on the abnormal weather of January last, which was one of the most remarkable winter months on record. The month was singularly dry, with an absence of snow or sleet—a somewhat unusual feature in January, even for any individual station, but far more remarkable as applying to the country as a whole. The special feature, however, was the striking absence of severe frost, the frequent prevalence of unusually mild weather, and as a result the abnormal warmth of the month, especially in the more northern parts of the kingdom. The mean temperature was generally over the whole country about 5° above the average, while at many places situated in the more northern parts of the kingdom, it was more than 6° above the average. The atmospheric pressure throughout the month was also very high, the mean being from two to three-tenths of an inch above the average.

Hull Scientific and Field Naturalists' Club.—At the usual fortnightly meeting (Dr. Hollingworth, M.R.C.S., in the chair), Mr. J. F. Robinson gave the results of the botanical work done on the club's outing to Brough the preceding Saturday afternoon, and confirmed some previous plant records. A visit had been paid to the patch of boggy ground around a spring below the "cockle-pits," a spot so well-known to botanists on account of the numerous plants of a sub-Alpine character which grow there. On the present occasion the place was yellow with the marsh marigold (*Caltha palustris*). The Secretary gave an account of the geological work done on the same occasion. Mr. G. H. Hill read a few notes on the yellow milk vetch (*Astragalus*), one of the plants collected at Brough. Mr. Robinson reported he had received a list of plants found in the Driffield neighbourhood from Mr. H. W. Blakeston, of Driffield, a member of the club. This was of value to him in connection with the flora of the East Riding, which is being prepared, as some of the species recorded by Mr. Blakeston had not previously been included in the club's list of East Riding plants. The Secretary exhibited some birds' skulls found on one of the excursions, and also the skull of a dog and some deer bones from the peat at Goole. The deer remains include the whole of the bones of the lower leg of possibly a fallow deer. Thanks to the excellent preserving properties of the peat, the remains are in perfect condition, so much so that even the hoofs and hair found with the bones are almost as fresh in appearance as if buried but yesterday. The dog's skull, though found at the same time, and undoubtedly of some age, is evidently not so old as the deer bones. The latter are stained a very dark colour, and were found at some depth; the dog's skull, however, though stained, is not to the same extent as the deer bones, and, moreover, the teeth, etc., are ramified in all directions by rootlets, pointing to its being found near the surface. The President exhibited some photographs taken on the previous Saturday whilst on the Brough excursion. A good show of different kinds of corallines was handed round by the lecturer and graphically described. These included many well-known forms from the east coast of Yorkshire, including "sea-hair," "sea-ferns," the "bottle-brush" and "herring-bone" corallines. The lecture was further illustrated by a very fine series of lantern slides specially prepared by the president for the meeting. These were principally photographs and photo-

micrographs of the different examples of corallines, which showed their beautiful structures to perfection. Mr. Phillips also assisted with his microscope.—*T. Sheppard, Hon. Sec., 78, Sherburn Street, Hull.*

WARRINGTON FIELD CLUB.—After an interval of nearly five years, the Warrington Field Naturalists have held another exhibition of objects connected with natural history. This took place on the evening of March 26th last; it was well-attended and quite successful. Aquatic life was represented in aquaria by Mr. J. L. Whittle, showing the early stages of trout, and Mr. L. Greening, the development of frog spawn, and other objects living in fresh water. Mr. E. E. Lowe showed eggs, skeletons and spirit specimens from the museum collection, to illustrate a paper read by him on "An Introduction to the Reptilia." Scarce local birds, mounted by himself, formed the contribution of Mr. Geo. Mounfield. A study of living ants was brought by Mr. William Webster, who also showed spiders taken in the district, and some original diagrams illustrating the ants. A long series of spiders was sent by Mr. L. Greening, whose beautiful mounting was admired. Entomology, especially lepidoptera, was liberally represented by Messrs. Cartwright, Collins, W. Mounfield and Womersley; Economic Entomology, by an extensive exhibit of insect foes of forest trees. Exotic insects were numerously shown by Mr. Mounfield, which had been obtained by him from tropical timber after it had reached England. Some of these arrived in larva or pupal stages, and had been reared by the exhibitor. Prehistoric animals of the Warrington district were represented by Mr. T. May, who also showed flint implements and early tools and weapons. Dr. White sent numerous fossils. Lantern slide pictures were shown by Messrs. Joseph Smith, Woodcock, Flatters, and Jackson, relating to prehistoric man, the geology of North Wales, and certain biological subjects. Microscopy was well in evidence, Mr. Flatters giving practical demonstrations in section cutting with a microtome invented and made by himself. Others brought a number of microscopes for the exhibition of slides of algae, bacteria, fungi, hydrozoa, etc. The visitors were received by the retiring and incoming presidents, Messrs. Woodcock and J. Shaw Green, and Mr. A. J. Jolley, the Hon. Secretary. Warrington naturalists are to be congratulated on the success of their exhibition, and the interest it has raised in the subject in the town.

NOTICES OF SOCIETIES.

*Ordinary meetings are marked †, excursions *; names of persons following excursions are of Conductors.*

LONDON GEOLOGICAL FIELD CLASS.—Conductor, Professor H. G. Seeley, F.R.S.

June 4.—*Hayward's Heath and Cuckfield: strata below the chalk south of London.
" 11.—*Nutfield to Redhill: a hill range of sandstone. Lower Greensand.
" 18.—*Marden Park and Godstone: a hill range of limestone. Chalk and upper greensand.
" 25.—*Ascot and Bracknell: hills on a sandstone plain. Bagshot sand and London clay.
" 2.—*Sevenoaks. parallel valleys and hills of stratification. Weald to chalk.

Hon. Class Secretary (Second Series), J. W. Jarvis, St. Mark's College, Chelsea, S.W.

BATTERSEA FIELD CLUB AND LITERARY AND SCIENTIFIC SOCIETY, Public Library, Lavender Hill, S.W.

June 11.—*Anstiebury and Leith Hill. Conducted by G. W. Young.
" 25.—Whole-day Excursion to Sea-side.

Hon. Sec. E. J. Davies, Marney Road, Clapham Common.

GEOLOGISTS' ASSOCIATION OF LONDON.

June 11.—*Godalming, Surrey. T. Leighton, F.G.S.
" 18.—*Crowborough and Eridge, Kent. R. S. Herries, M.A., F.G.S., and Dr. G. Abbott.
" 25.—*Sudbury, Suffolk. J. W. Gregory, D.Sc., F.G.S.
July 9.—*Isle of Sheppey, Kent. W. Whitaker, F.R.S., Pres. G.S., and T. V. Holmes, F.G.S.
" 16.—*Warlingham, Surrey. W. Whitaker, F.R.S., Pres. G.S.
" 28 to Aug. 3.—*Birmingham, Nuneaton, Dudley, Lickey, Cannock, etc. Prof. C. Lapworth, LL.D., F.R.S., W. W. Watts, M.A., F.G.S., W. J. Harrison, F.G.S., and W. Wickham King, F.G.S.
Sept. 10.—*Gravesend, Kent. G. E. Dibley, F.G.S.

Further particulars from *Horace W. Monckton, Hon. Sec. (Excursions), 10, King's Bench Walk, Temple, E.C.*

LAMBETH FIELD CLUB AND SCIENTIFIC SOCIETY, St. Mary Newington Schools, Newington Butts, S.E.

June 6.—†Annual Meeting.
" 11.—*Shirley Hills and Addington Woods.
" 25.—*Perivale and Horsendon Hill.

Hon. Sec., H. Wilson, 14, Melbourne Square, Brixton Road.

NORTH LONDON NATURAL HISTORY SOCIETY.

June 16.—†"The Catocalidae." E. M. Dadd.
" 18.—Whole-day Excursion to Deal—leader, L. J. Tremayne.

Visitors will be cordially welcomed at all meetings and excursions. *Lawrence J. Tremayne, Hon. Sec.*

HULL SCIENTIFIC AND FIELD NATURALISTS' CLUB.

June 1.—Meeting.
" 4.—*Walk by River Hull Bank, Dunswell to Beverley.
" 8.—†Microscopic Exhibition. Members.
" 11.—*Kelsey Hill.
" 18.—*Skipsea (waggonettes from Hornsea).
" 22.—†Lecture: "Foraminifera," illustrated. R. H. Philip.
" 25.—*Barton and South Ferriby.
" 29.—Meeting

Meetings are held at 72, Prospect Street, 8 p.m.
T. Sheppard, Hon. Sec.

LINCOLNSHIRE SCIENCE SOCIETY.

June 11.—*Swan's Pit, for sub-divisions of the Lias. J. H. Cooke, F.G.S., who will give an address on "The Geology of Lincoln City."
" 29.—*Scawby Woods.
July 16.—*Skellingthorpe and Doddington woods, ponds and Old Trent gravels.
Sept. 3.—*Barkstone, for Syston and Belton Parks. Rev. E. Nelson, M.A.
" 21.—*Woodhall Spa: botany of the Moors; glacial beds.
Oct. 8.—*Torksey: Old Trent gravels. W. E. Asquith.

Hon. Sec., G. A. Grierson, F.L.S., 312, High Street, Lincoln.

NOTTINGHAM NATURAL SCIENCE RAMBLING CLUB.

Conductors of Rambles:
Geology, J. Shipman, F.G.S.; *Botany*, W. Stafford.

June 4.—*Geology. Meet under clock, G.N.R. Station, 2.15 p.m., for Kimberley: coal measures, magnesium, limestone, etc. Fare and tea, 1s. 9d.
" 18.—*Botany. Meet at Midland Station, 2.15 p.m. Attenborough and Burton.
July 2.—*Geology. Meet at Midland Station, 1.15 p.m., for Mansfield: sandstone, etc. Fare and tea, 3s. 3d.
" 16.—*Botany. Meet at Midland Station, 1.15 p.m., for Hucknall.
" 30.—*Geology. Meet in front of University College, Shakespeare Street, 2.30 p.m., drive to East Leake and Gotham: marls, shales, gypsum, etc. Fare and tea, 2s. 6d.; tickets to be taken before July 30.
Aug. 13.—*Botany. Meet at Emmanuel Church, Woodborough Road, 2.30 p.m., for Lambley Dumbles.
" 27.—*Geology. Meet at Sneinton Baths, 2.45 p.m., for Colwick for Bunter Pebble Beds, Keuper strata, etc.
Sept. 10.—*Botany. Meet at Lodge, Waverley Street entrance, to examine Arboretum and Pater Herbarium at University Museum.
Oct. 29.—†Annual Meeting and Exhibition, 4.15 p.m., Natural Science Laboratory, University College.

Hon. Sec., W. Bickerton, 187, Noel Street.

PRESTON SCIENTIFIC SOCIETY.

June 11.—*Visit to Owens College.
" 30.—*Through the Trough of Bowland.
July 14.—*Grange.
" 30.—*Visit to Stonyhurst College.
Aug. 20.—*Brock Bottoms.
Sept. 8.—*Ingleton.

W. Hy. Heathcote, F.L.S., Sec., 47, Frenchwood Street.

SCARBOROUGH FIELD NATURALISTS' SOCIETY.

June 2.—†"Chara and Nitella: their structure, life and beauty." D. W. Bevan.
,, 16.—†"Stems." Miss Major.
,, 18.—*With Y.N.U. to Hovingham and Wigganthorpe.
,, 30.—†Marine Conversazione.
Meetings held in the Museum at 8.15 p.m.

Hon. Secs., E. R. Cross and H. Herbert, 75, Prospect Road.

YORKSHIRE NATURALISTS' UNION.

June 20.—*Wigganthorpe and Terrington Carr.
July 9.—*Jerveaux Abbey
,, 29 to Aug. 1.—*Easington for Spurn Point.
Aug. 19.—†Annual Meeting at Scarborough.

METROPOLITAN SCIENTIFIC SOCIETIES.

The following is a list of societies in the London district devoted to natural science, with hours and places of meeting. They may be visited with introduction from a Fellow, Member, or Secretary. Will secretaries send additions or corrections.

ANTHROPOLOGICAL INSTITUTE OF GREAT BRITAIN, 3, Hanover Square. Second and fourth Tuesdays at 8.30 p.m., November to June.

BATTERSEA FIELD CLUB AND LITERARY AND SCIENTIFIC SOCIETY. Public Library, Lavender Hill, S.W. Thursdays, 8 p.m.

CITY OF LONDON COLLEGE SCIENCE SOCIETY, White Street, Moorfields, E.C. Last Wednesday in each month, October to May, 7.30 p.m.

CITY OF LONDON ENTOMOLOGICAL AND NATURAL HISTORY SOCIETY, London Institution, Finsbury Circus. First and third Tuesdays, 7.30 p.m.

CONCHOLOGICAL SOCIETY, LONDON BRANCH, St. Peter's Rectory, Walworth. Irregular meetings. Rev. J. W. Horsley, President, will answer enquiries.

CROYDON MICROSCOPICAL AND NATURAL HISTORY CLUB, Public Hall. Third Tuesdays, October to May, 8 p m.

DULWICH SCIENTIFIC AND LITERARY ASSOCIATION. Fortnightly lectures Lordship Lane Hall, second and fourth Mondays, 8.15 p.m., from October, for winter season.

EALING NATURAL SCIENCE AND MICROSCOPICAL SOCIETY. Victoria Hall, Ealing. Second and last Saturdays. October to May, 8 p.m.

ENTOMOLOGICAL SOCIETY, 11, Chandos Street, Cavendish Square. First Wednesday, October to June (except January). Third Wednesday, January, February, March and November, 8 p.m.

GEOLOGISTS' ASSOCIATION, University College, Gower Street. First Friday, 8 p.m., November to July.

GEOLOGICAL SOCIETY OF LONDON, Burlington House, Piccadilly. First and third Wednesdays, 8 p.m., November to June.

GREENHITHE NATURALISTS' AND ARCHÆOLOGICAL SOCIETY, 7, The Terrace. First Fridays, 7 p.m.

LAMBETH FIELD CLUB AND SCIENTIFIC SOCIETY, St. Mary Newington Schools, Newington Butts, S.E. First Mondays all the year and third Mondays in winter, 8 p.m.

LINNEAN SOCIETY OF LONDON, Burlington House, Piccadilly. First and third Thursdays at 8 p.m., November to June.

LONDON AMATEUR SCIENTIFIC SOCIETY, Memorial Hall, Farringdon Street, E.C. Fourth Friday in each month, October to May, 7.30 p.m.

LUBBOCK FIELD CLUB. Working Men's College, Great Ormond Street, Bloomsbury, W.C. Excursions second Sundays, Meetings following Mondays, 8 pm.

MALACOLOGICAL SOCIETY OF LONDON, meets in Linnean Society's Rooms, Burlington House. Second Friday each month, November to June, 8 p.m.

MINERALOGICAL SOCIETY. Meets in rooms of Geological Society, February 4th, April 14th, June 23rd, November 17th, 8 p.m.

NONPAREIL ENTOMOLOGICAL AND NATURAL HISTORY SOCIETY, 99, Mansfield Street, Kingsland Road, N.E. First and third Thursdays, 8 p.m.

NORTH KENT NATURAL HISTORY AND SCIENTIFIC SOCIETY. St. John's Schools, Wellington Street, Woolwich. Alternate Wednesdays, 7.30 p.m.

NORTH LONDON NATURAL HISTORY SOCIETY, North-East London Institution, Hackney Downs Station. First and third Thursdays, 7.45 p.m.

QUEKETT MICROSCOPICAL CLUB, 20, Hanover Square. First and third Fridays, 8 p.m.

ROYAL BOTANIC SOCIETY OF LONDON, Regent's Park. Second and fourth Saturdays at 3.45 p.m.

ROYAL HORTICULTURAL SOCIETY, 117, Victoria Street, S.W. Second and fourth Tuesdays, except December to February; 2 p.m. on show days, which vary.

ROYAL METEOROLOGICAL SOCIETY, 22, Great George Street, Westminster. 3rd Wednesday, November to June, 8 p.m.

ROYAL MICROSCOPICAL SOCIETY, 20, Hanover Square. Third Wednesdays, October to une, 8 p.m.

SELBORNE SOCIETY, 20, Hanover Square. No winter meetings.

SIDCUP LITERARY AND SCIENTIFIC SOCIETY, Public Hall, Sidcup. First and third Tuesdays, October to May, 8 p.m.

SOUTH LONDON ENTOMOLOGICAL AND NATURAL HISTORY SOCIETY, Hibernia Chambers, London Bridge, S.E. Second and fourth Thursdays, 8 p.m.

SUTTON SCIENTIFIC AND LITERARY SOCIETY, Public Hall Chambers. Second and forth Tuesdays, 8 p.m.

WEST KENT NATURAL HISTORY, MICROSCOPICAL AND PHOTOGRAPHIC SOCIETY. Meets in School for Sons of Missionaries, Blackheath, third Wednesday, in December, fourth Wednesdays in October, November, January, February, March, April, May, 8 p.m.

ZOOLOGICAL SOCIETY OF LONDON, 3, Hanover Square. First and third Tuesdays, 8.30 p.m., November to August.

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NOTICE.—Contributors are requested to strictly observe the following rules. All contributions must be *clearly* written on one side of the paper only. Words intended to be printed in *italics* should be marked under with a single line. Generic names must be given in full, excepting where used immediately before. Capitals may only be used for generic, and not specific names. Scientific names and names of places to be written in round hand.

THE Editor will be pleased to answer questions and name specimens through the Correspondence column of the magazine. Specimens, in good condition, of not more than three species to be sent at one time, *carriage paid*. Duplicates only to be sent, which will not be returned. The specimens must have identifying numbers attached, together with locality, date and particulars of capture.

THE Editor is not responsible for unused MSS., neither can he undertake to return them, unless accompanied with stamps for return postage.

EXCHANGES.

NOTICE.—Exchanges extending to thirty words (including name and address) admitted free, but additional words must be prepaid at the rate of threepence for every seven words or less.

MINERALS and rock specimens for exchange.—C. Casey, Grianan, Princess Road, Bournemouth West.

FINE slide of dentrite crystals or Amphipleura pellucida in exchange for good diatom (preferred) or other slide. Photographic apparatus for exchange; $\frac{1}{12}$ inch objective wanted.—R. Borrows, 18, Pensbury Street, Darlington.

OFFERED, British and foreign shells for others not in collection; correspondence desired.—Mrs. Heitland, The Priory, Shrewsbury.

WANTED, a double nose-piece in exchange for a vasculum and several fine minerals (crystals).—P. J. Roberts, 11, Back Ash Street, Bacup.

PHOTOGRAPHS wanted of Dr. G. J. Ullman, F.R.S., Prof. W. K. Clifford, F.R.S., George Henry Lewes. Offered, photos of other scientific celebrities, or cash.—C. Fielding, Clover Hill, Halifax.

SOME microscopical slides for exchange.—C. Lance, Brislington House, Bristol.

WANTED, fossils from Jurassic, especially Lias ammonites, Devonian, Silurian or Cambrian Offered, fossils, named and localised, from the crags, oligocene, eocene, chalk, gault, oolites and carboniferous; minerals, rocks, or state wants.—E. Dixon, 55, Brownhill Road, Catford, S.E.

PHOTOMETER WANTED, secondhand, state maker and what wanted.—F. Winstone, 1, Northumberland Avenue, London, W.C.

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