particles of native iron, in their transit through the air, must undergo combustion, and, like small portions of iron from a smith's anvil, be transformed either entirely or at the surface only into magnetic oxide, and in this latter case the nucleus is protected from further oxidation by the coating which thus covers it.

One may suppose that meteorites in their passage through the atmosphere break into numerous fragments, that incandescent particles of iron are thrown off all round them, and that these eventually fall to the surface of the globe as almost impalpable dust, in the form of magnetic oxide of iron more or less completely fused. The luminous trains of falling stars are probably due to the combustion of these innumerable particles, resembling

FIG. 2.

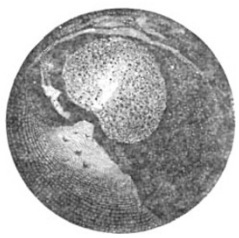

FIG. 3.

FIG. 2.—Black spherule with metallic nucleus (60 : 1). This spherule, covered with a coating of black shining magnetite, represents the most frequent shape. The depression here shown is often found at the surface of these spherules. From 2375 fathoms South Pacific.

FIG. 3.—Black spherule with metallic nucleus (60 : 1). The black external coating of magnetic oxide has been broken away to show the metallic centre, represented by the clear part at the centre. From 3150 fathoms Atlantic.

the sparks which fly from a ribbon of iron burnt in oxygen, or the particles of the same metal thrown off when striking a flint. It is easy to show that these particles in burning take a spherical form, and are surrounded by a layer of black magnetic oxide.

Among the magnetic grains found in the same conditions as these we have just described are other spherules, which we refer to the *chondres*, so that if the interpretation of a cosmic origin for the magnetic spherules with a metallic centre was not established in a manner absolutely beyond question, it almost becomes so when we take into account their association with the silicate spherules, of which we have now to speak. It will be seen by the microscopic details that these spherules have quite the constitution and structure of *chondres* so frequent in meteorites of the most ordinary type, and on the other hand they have never been found, as far as we know, in rocks of a terrestrial origin; in short, the presence of these spherules in the deep-sea deposits, and their association with the metallic spherules, is a matter of prime importance. Let us see how we distinguish these silicate spherules, and the points upon which we rely in attributing to them a cosmic origin.

Among the fragments attracted by the magnet in deep-sea deposits we distinguish granules slightly larger than the spherules with the shining black coating above described. These are yellowish-brown, with a bronze-like lustre, and under the microscope it is noticed that the surface, instead of being quite smooth, is grooved by thin lamellæ. In size they never exceed a millimetre, generally they are about 0·5 mm. in diameter; they are never perfect spheres, as in the case of the black spherules with a metallic centre; and sometimes a depression more or less marked is to be observed in the periphery. When examined by the microscope we observe that the lamellæ which compose them are applied the one against the other, and have a radial eccentric disposition. It is the leafy radial structure (*radialblättrig*), like that of the *chondres* of bronzite, which predominates in our preparations. We have observed much less rarely the serial structure of the *chondres* with olivine, and indeed there is some doubt about the indications of this last type of structure. Fig. 4 shows the characters and texture of one of these spherules magnified 25 diameters. On account of their small dimensions, as well as of their friability due to their lamellar structure, it is difficult to polish one of these spherules, and we have been obliged to study them with reflected light, or to limit our observations to the study of the broken fragments.

These spherules break up following the lamellæ, which latter are seen to be extremely fine and perfectly transparent. In rotating between crossed nicols they have the extinctions of the rhombic system, and in making use of the condenser it is seen that they have one optic axis. It is observed also that when several of these lamellæ are attached, they extinguish exactly at the same time, so that everything induces us to believe that they form a single individual.

In studying these transparent and very thin fragments with the aid of a high magnifying power, it is observed that they are dotted with brown-black inclusions, disposed with a certain symmetry, and showing somewhat regular contours; we refer these inclusions to magnetic iron, and their presence explains how these spherules of bronzite are extracted by the magnet. We would observe, however, that they are not so strongly magnetic as those with a metallic nucleus.

We designate them under the name of bronzite rather than of enstatite, because of the somewhat deep tint which they present; they are insoluble in hydrochloric acid. Owing to the small quantity of substance at our disposal, we were obliged to limit ourselves to a qualitative analysis. We have found in them silica, magnesia, and iron.

We have limited our remarks at this time to these succinct details, but we believe that we have said enough to show that these spherules in their essential characters are related to the *chondres* of meteorites, and have the same mode of formation. In conclusion, we may state that when the coating of manganese depositions, which surround sharks' teeth, ear-bones of Cetaceans and other nuclei, is broken off and pounded in a mortar to

Fig. 4.—Spherule of bronzite (25 : 1) from 3500 fathoms in the Central South Pacific, showing many of the peculiarities belonging to *chondres* of bronzite or enstatite.

fine dust, and the magnetic particles then extracted by means of a magnet, we find these latter to be composed of silicate spherules, spherules with a metallic centre, and magnetic iron, in all respects similar to those found in the deposits in which the nodules were embedded.

We have recently examined the dust collected by melting the snow at the Observatory on Ben Nevis, in order to see whether, in that elevated and isolated region, we should be able to find volcanic ashes or cosmic spherules analogous to those we have described. This atmospheric dust, which we have examined microscopically, has not shown any particles which could with certainty be regarded as identical with those substances which are the subject of this paper. Particles of coal, fragments of ashes, and grains of quartz predominated. Besides these, there were fragments of calcite, augite, mica, and grains of rock of all forms and of variable dimensions. These were associated with fibres of cotton, of vegetables, splinters of limonite and of tin—in short, everything indicating a terrestrial origin.

In order to give an idea of the facility with which the winds may carry these matters even to the summit of the mountain, we may add that Mr. Omond has sent to us fragments of crystalline rocks, some having a diameter of two centimetres, which, he states, were collected on the surface of the snow at the summit after the storm of January 26, 1884.

Arrangements are being made to collect the dust at the top of Ben Nevis during calms with great care.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

COLLEGE OF AGRICULTURE, DOWNTON, SALISBURY.—At the close of the winter session on Wednesday, 16th inst., the

certificate of membership and the certificate of proficiency in practical agriculture were granted to Mr. R. A. Benson, F.H.A.S., 11, Caledonia Place, Clifton; Mr. W. de Hoghton Birch, 1, Bathwick Street, Bath; and Mr. C. W. Lincoln Hardy, F.H.A.S., Gittisham, Honiton, Devon; and the certificate of proficiency alone to Mr. B. S. Dunning, 2, Warwick Square, S.W.

THE authorities of University College, Liverpool, have asked that that institution be incorporated with Victoria University.

SOCIETIES AND ACADEMIES

LONDON

Linnean Society, April 3.—Sir J. Lubbock, Bart., president, in the chair.—Mr. W. Brockbank exhibited a series of double daffodils, wild forms of *Narcissus pseudo Narcissus*, which were gathered in a Welsh meadow from among many of both the single and double forms occurring there in every stage of growth. Sections invariably revealed stamens and pistils, and in two of the most double forms ovaries filled with seeds were present. With this evidence he therefore contended against the current notion of cultivation and root-growths having produced a heterogeneous multiplication of the perianth segments, split-up crown, and conversion of stamens into petal-growths, his belief being that the plants in question were propagated in the ordinary seed-bearing manner.—Mr. R. M. Middleton showed a jackdaw with albinism of the wing feathers, causing considerable resemblance in the bird to a magpie.—Prof. P. M. Duncan gave a revision of the families and genera of the Sclerodermic Zoöantharia, the Rugosa excepted. Since MM. Milne-Edwards and Haimes' work, 1857-60, no systematic revision of the Madreporaria has appeared, while since then a great number of new genera have been founded; hence the necessity for a revision has arisen, and more especially in consequence of the morphological researches of Dana, Agassiz, Verrill, and Moseley. Prof. Duncan explained that the old sections of the Zooantharia required modification and addition. In his present revision the sections Aporosa and Perforata remain shorn of some genera, the old family Fungidæ becomes a section with three families, two of which are transitional between the sections just mentioned. The section Tabulata disappears, some genera being placed in the Aporosa, and the others are relegated to the Hydrozoa according to Moseley. The Tubulosa cease to be Madreporarian. Hence the sections treated are Madreporia-Aporosa, M.-Fungida, and M.-Perforata. The nature of the hard and soft parts of these forms is considered in relation to classification, and an appeal is made to naturalists to agree to the abolition of many genera, the author having sacrificed many of his own founding. The criticism of 467 genera permits 336 to remain good, and as a moderate number (36) of sub-genera are allowed to continue, the diminution is altogether about 100. The genera are grouped in alliances, the numbers in families being unequal. Simplicity is aimed at, and old artificial divisions dispensed with. There is a great destruction of genera amongst the simple forms of Aporosa, and a most important addition to the Fungida. The genera *Siderastreæ* and *Thamnastreæ* are types of the family Plesiofungidæ, as are *Microsolenia* and *Cyclolites* of the family Plesioporitidæ. The families Fungidæ and Lophoseridæ add many genera to the great section Fungida. There is not much alteration in respect of the Madreporaria-Perforata, but the sub-family Eusammineæ are promoted to a family position as the Eusammidæ.—Mr. Chas. F. White thereafter read a note on some pollen from funereal garlands found in an Egyptian tomb *circa* B.C. 1000. It appears that from among the dried flowers of *Papaver Rhœas* the pollen obtained freely absorbed water, became swollen, and in other respects the grains were barely able to be differentiated by the microscope from the pollen grains of the recent poppy.—A paper was read by Mr. F. J. Briant, on the anatomy and functions of the tongue of the honey bee. Authorities, it seems, are yet divided in opinion as to how the organ in question acts. Kirby and Spence, Newport and Huxley, aver the bee laps its food; while Hermann Müller and others attribute a full share to the terminal whorl of hairs to which the honey adheres, and therefrom is withdrawn. Mr. Briant, on the other hand, from experiment and study of the structures, is inclined to the view that the honey is drawn into the mouth through the inside of the tongue by means of a complicated pumping action of the organ, aided by the closely contiguous parts.

Chemical Society, April 3.—Dr. W. H. Perkin, president, in the chair.—The following papers were read:—On the influence of certain phosphates upon vinous fermentation, by A. G. Salamon and W. de Vere Mathew. It has been suggested that the addition of phosphates to beerworts stimulates the growth of the yeast-plant and increases the rapidity of attenuation of the wort. The authors find that ordinary English wort contains an excess of phosphoric acid over that which is proved by their experiments to be most favourable to fermentation; hence it follows that the addition of phosphates to wort is not advisable.—On the occurrence of rhabdophane in the United States, by W. N. Hartley. The author shows that a new mineral, scovillite, described by Brush and Penfield in the *Amer. Journ. Sci.*, xxv. 459, is but a variety of rhabdophane. In a subsequent number of the journal, March 1884, the identity of the two minerals is recognised by the above authors.

Geological Society, April 2.—Prof. T. G. Bonney, F.R.S., president, in the chair.—Frank Gotto and George Varty Smith were elected Fellows, and Dr. E. Mojsisovics von Mojsvár, of Vienna, a Foreign Correspondent of the Society.—The following communications were read:—The rocks of Guernsey, by the Rev. E. Hill, M.A.; with an appendix on the microscopic structure of some of the rocks, by Prof. T. G. Bonney, F.R.S. The southern part of the island is a high plateau consisting entirely of gneiss. This is very coarse, and the bedding is seldom well marked. The bedding, when visible, coincides with the foliation, and the author hopes that hereafter an order of succession may be established. At Rocquaine Castle occur a few slaty beds intercalated in the gneiss, the origin of which is somewhat difficult to understand. The northern part, low ground with hummocks, consists principally of a group of crystalline or subcrystalline rocks, in constitution diorites or syenites. They are described by Ansted as sedimentary rocks metamorphosed into syenites; but they show no bedding either in the many quarries, or, in general, in the shore outcrops, nor do their varieties occur in any manner indicating an order of succession. They appear at Castle Cornet to meet the gneiss intrusively, and their microscopic structure is igneous. A remarkable appearance of bedded structure at Fort Doyle is the only strong argument for a metamorphic origin, and this may be explained as a caught-up mass in conjunction with crushing-planes. The author therefore regards them as igneous. An oval area between St. Sampson's and St. Peter's Port is occupied by hornblendic rocks, locally called "birdseye," which may be described as hornblende-gabbros. These also have been called metamorphic. They too, at Hogue-à-la-Perre and another point, present appearances of bedding; but on the same general grounds as for the preceding group these also are regarded as igneous. Two granitic masses are described: the coarse pink granite of Cobo, on the west coast, and the finer-grained gray granite weathering pink of Lancresse, on the north. Each is seen to intrude: the Cobo granite into gneiss at Hommet Barracks, the Lancresse granite into diorite at Fort Le Marchant. Besides these are some smaller masses. Dykes are remarkably abundant and various. Granites and elvans are plentiful everywhere; felsites very rare. The majority of the dykes are diorites, varying in coarseness and often of enormous size; there is also mica-trap. In some of these dykes a cleavage has been developed, so that some resemble slates. Infiltration-veins are abundant. In relative age the gneiss appears to be the oldest rock, the hornblende-gabbro to be next, then comes the diorite group, while the granites are newer still. Of the dykes the newest are the compactest diorites. As to the absolute geological age of the rocks no satisfactory evidence at present is known; it will have to be sought for in the other islands and in France.—On a new specimen of *Megalichthys* from the Yorkshire coalfield, by Prof. L. C. Miall.—Studies on some Japanese rocks, by Dr. Bundjiro Kotô. Communicated by Frank Rutley. The author has studied series of Japanese rocks from the collection of the Tokio University and the Geological Survey of Japan. The microscopical investigation was carried on at the Mineralogical Institute at Leipzig, under the direction of Prof. Zirkel, and the chemical analyses were made in the laboratory of Prof. Knop. The most abundant rocks are the pyroxene-andesites, which are not of a glassy texture, but for the most part holocrystalline. The most abundant mineral in these rocks is a plagioclose felspar with twinned and zonal structure, which is proved, by its extinction-angles and by the chemical analysis of its isolated fragments, to be labradorite. Sanadine is present in small quantities. The augites of these rocks present many peculiarities; they are all decidedly