Discovered by Isaac Carroll, Esq. (1864), on mosses in the Scottish mountains, Lochna-Cat.

A species well distinguished by its small 3-septate spores. It is probably parasitic.

22. *Verrucaria endococcoidea*, Nyl.

Thallus proprius nullus; apothecia nigra, minuta, endococcoidea, perithecio parte immersa tenui fusca (latit. 0·12–0·16 millim.), parte supera (extus visibili) convexula; sporæ $8^{\text{næ}}$, incolores, oblongo-ellipsoideæ, 3-septatæ, longit. 0·016–0·018, crass. 0·006–0·007 millim.; paraphyses nullæ. Gelatina hymenea iodo vinose rubens; sporæ dilute cærulescentes.

Discovered by Admiral Jones growing parasitically on the thallus of *Lecidea excentrica*, Ach., near the summit of Ben Lawers, Scotland.

Apparently allied to *V. dubiella*, Nyl. From others it scarcely differs in the spores becoming blue with iodine.

23. *Verrucaria platypyrenia*, Nyl.

Late effusa; apotheciis planis vel planiusculis (latit. 0·5 millim.), primo hypophlœodeis opacis; sporæ incolores (vel demum vetustate fuscescentes), oblongæ, 3–5-septatæ, longit. 0·023–0·030, crassit. 0·009–0·011 millim.; paraphyses molles, irregulares, vel non distinctæ.

On bark near Cork, Ireland. Discovered by Isaac Carroll, Esq. Probably only a variety of *V. epidermidis*, Ach.

BIBLIOGRAPHICAL NOTICES.

Manual of Geology. By The Rev. Samuel Haughton, M.D., F.R.S., Fellow of Trinity College, Professor of Geology in the University of Dublin. London: Longman & Co., 1865. 8vo. pp. 360, with sixty-six woodcuts.

What is Geology? And what is a Manual of Geology? Some think that they have mastered the science when they know something about the materials of the crust of the earth (Mineralogy and Lithology), about their order of position (Stratification), about the methods and agents of their arrangement (Geological Dynamics), about the fossils representing former animals and plants (Palæontology), about the various distribution of old seas and lands and the successive faunæ and floræ (Theoretical Geology), and about the practical uses of geological knowledge. To get thus far they provide themselves with as limited an acquaintance with chemistry, physics, and biology as is compatible with their task (or such only as they happen to pick up), and take for granted very much of both the

observational and hypothetical bases of the science from their teachers and text-books.

But really they have not even then the whole range of the science before them; for they have been studying the earth's crust and surface, not the earth as a whole. What is known of the earth's phenomena as a planet has been gathered by astronomers and geodetical surveyors, but it does not the less belong to the observational part of geology (Geognosy). What is known of this planet's history is the combined result of astronomical, physical, chemical, and mineralogical research, and belongs to theoretical geology; for it illustrates the history of the earth in early times. Does any manual, guide-book, class-book, or elementary treatise on geology supply a concise *résumé* of what is known on all the above-mentioned departments of geological science, so that the Student can see what he has to learn and how to learn it, and the Expert feel that he has a real *aide-mémoire*, complete, with additions and corrections to the latest date?

The Rev. Dr. Haughton has added another to the many good geological treatises (by Naumann, Vogt, D'Halloy, Beudant, De la Beche, Phillips, Lyell, Jukes, Hitchcock, Dana, Ansted, Page, and others) already existing; but they are either too special and partial, too diffuse and yet too imperfect, or otherwise ill adapted for ordinary students. Naumann's comprehensive and well-planned 'Lehrbuch' is three-volumed, and much too large for general students. Dana's is a model manual, but it is avowedly systematized on American geology. Thus the student, not training for special or professional geology, but working up a general knowledge of the earth and its history, feels the want of a concise, clear, and trustworthy guide-book for the many-branched science of geology, leading him away from the slough of popular notions and lapsing hypotheses, through the rocky paths of experiment and observation, to the higher ranges commanding a good general view of his subject, without waste of time by devious wanderings into the unknown, or hobby-ridings in the bypaths of an author's favourite fields.

In the book before us Dr. Haughton publishes fifteen Lectures delivered in 1862, and relating chiefly to Palæontology, or the history of the earth's inhabitants. He first treats of the origin of the globe, and the physical conditions necessary to be established on the earth before it could have had any inhabitants at all. First he refers to his acceptation of Laplace's nebular hypothesis, as a basis, in some former lectures on geology, and adopting Durocher's hypothesis of a difference of materials in the first and second incandescent layers under the crust of the cooling globe (the outer, *acid* or granitic magma, and the second, *basic* or trappean magma), arranged by specific gravity, dependent on chemical constitution, changed by oxidation in course of time, and forced out in succession through fissures during the contraction of the earth's crust. The formation of the atmosphere, the salinity of the sea, and some other points complete the subjects of the first Lecture. This has two valuable Appendices. 1. A translation of Durocher's Essay on Comparative Petrology; and 2. Notes on the Origin of Granite, by the author.

Sandstones, schists, and limestones, as types of the aqueous or stratified rocks, their modes of formation, their characters and classification, occupy Lecture II.

Concretions or nodules (including rocksalt and gypsum) in strata are next studied, and, together with modes of fossilization, form the third Lecture. The fourth considers geological time, tests of age in rocks stratified and unstratified (namely, relative position, mineral composition, and characteristic fossils), the thickness of strata, and its relation to time and to the development of organic life (a greater number of species accompanying a given thickness of stratified material at later than at older periods). Appendices on the theories of solar heat, and the calculation of geological time based thereon, accompany Lecture IV. The rate of production of species of crustacea, fishes, reptiles, and mammals in past time, and their relative zoological importance and chronological development, are tabulated and shown by diagrams in Lecture V., which also treats of the classification of animals by Aristotle, Linné, Cuvier, and Lamarck. Dr. Haughton then concisely defines—1. The *Spondylozoa* (Vertebrates); 2. The *Entomozoa* (Annulose animals); 3. The *Malacozoa* (Mollusks); 4. The *Echinozoa* (Echinoderms); 5. The *Cœlenterozoa* (Corals, &c.); and, 6. The *Protozoa*. The Appendices give details of classificatory arrangements by Moses, Aristotle, Linné, and Cuvier. Lecture VI. has the Azoic and Palæozoic rocks for its subject. In 1862 most metamorphic rocks were commonly regarded as being "Azoic;" now, however, more of them are known to be fossiliferous, and nearly all (leaving still some granitic masses to be explained, perhaps by Durocher's theory) are referred to some series or other of the known stratified rocks, the *oldest* groups having, of course, the largest proportion of *altered* rocks. The classification of rocks (based on succession in time and difference of formation) by Linné and Werner, and Hutton's correction of Wernerian notions, are given. The great granitic and gneissose tracts (now regarded mainly as belonging to the Laurentian system) are briefly described. The Lower Palæozoic strata are then referred to—first, as being badly provided with divisional names; secondly, as characterized in the lower group by Mollusks and Crustaceans ("Malacozoic"), and in the upper by Fishes ("Ichthyozoic").

The wide range of species, not only in Palæozoic but in Mesozoic rocks, and the increase of difficulties in regard to the contemporaneity or non-contemporaneity of strata containing similar fossils, are also treated of in this chapter; and the author seems to think that when Ammonites and Ichthyosaurs lived in a warm climate at what are now the Arctic Regions, the equatorial heat must have been unbearable; that as the globe cooled creatures migrated towards the equator from high latitudes to find a congenial temperature, new forms replacing them; and that, hence, strata in different latitudes bearing similar or characteristic fossils are not strictly contemporaneous, but subdivisible into representatives of many periods of time. This last idea, already handled by De la Beche, Forbes, and Huxley, and illustrated by Jenkins, Duncan, and others, seems true

enough, whether the climates were influenced by the internal heat of the globe (which we thought to have been disproved by Hopkins), or by steam and carbonic acid of the atmosphere keeping the earth warm in early days: and now we speak of *Homotaxis* ("same arrangement"), and of the Homotaxeous relationship of strata, instead of hypothetical and possibly false *contemporaneity*. In the Appendices to this chapter we have, first, Linné's theory of the formation of rocks; and secondly, the author's views as to the formation of continents and mountain-chains, already known as a bold and ingenious theory, full of worth.

Lecture VII. is preliminary to the study of fossils, being devoted to the explanation of the value of different kinds of symmetry in inorganic and organic nature, more particularly to the geologist, who has rarely anything but the hard parts of a creature to deal with. There is the symmetry of minerals, of plants, and of animals. The first is purely geometrical; and the lower the creature in the scale of organization the more perfect is its subjection to geometrical laws. In the highest development of the animal kingdom "we have the symmetry of form reduced to its simplest condition, that of a bilateral symmetry with reference to a plane, all symmetry with reference to a line having been abandoned." The consideration of this subject, which seems to be a favourite with the author, leads him to treat at length of the cells of bees, and of the opinions of Pappus, Maraldi, Reaumur, and Darwin thereon, the last-named getting but little credit.

The eighth Lecture commences the history of the creatures that lived at various times on the earth's surface, and premises "that there is a general progress in complexity of organization as we follow the history of the globe from the oldest to the newest strata, although there are many exceptions." The *Protozoa, Cœlenterozoa,* and *Entomozoa* are comprised in this lecture. Belonging to the first, the *Foraminifera* are spoken of; but the classification given for them at p. 174 is quite obsolete and superseded by Carpenter's. *Nummulina* is chiefly referred to, and the range of the Nummulitic strata. *Receptaculites* is also also brought forward, and, with *Orbitolites*, shows the geometrical symmetry of the "Spiral of Archimedes." Polycystines and Sponges are also briefly treated of; but even that little might be greatly improved. The Corals (*Hydrozoa* and *Actinozoa*) come next; and their symmetry being related to a *line*, whilst that of Echinoderms is related to a *plane*, is pointed out as one of the reasons for separating the latter, as a higher group, from the Cœlenterates. The Corals are better treated than the Protozoans, as to definition and classification. The *Entomozoa* or *Articulata* (Insects, Myriapods, Arachnids, Crustaceans, and Worms) are then noticed, more especially the Crustacea, including the Cirripedes, which, however, are not true Crustaceans, and among which certainly *Aptychus* has no place. With reference to palæontological laws, the Rev. Dr. Haughton prefers to say "that the Neozoic Crustaceans were superior in organization to the Palæozoic" than "that the Crustaceans progressed as the world grew older."

Fossil fishes occupy Lecture IX. They characterized the Upper Palæozoic (or Ichthyozoic) period. "There can be little doubt," says the author, "that the Palæozoic fishes approach the reptilian type more closely than the Neozoic fishes, and that they are entitled, if on this account alone, to be regarded as possessing a higher organization."

Lecture X. takes in the "Phytozoic Period" (seemingly the same as the "Ichthyozoic"), treating of fossil Plants, especially Conifers and Acrogens, Carboniferous plants, Sigillariæ and Lepidodendra, Calamites and Ferns, and giving special and general remarks thereon. The Appendix contains the author's elaboration of "the Phyllotaxis of Whorls."

Lecture XI. begins the Neozoic Period, and takes up the fossil Reptiles, so abundant as to characterize the "Saurozoic Period." We have a classification of Reptiles; and notes on the Chelonians, Saurians, Pterodactyles, Enaliosaurians (including a limbless tadpole Ichthyosaur! to be seen at Trinity College, Dublin), Labyrinthodonts, Ophidians, and Batrachians, in succession, form a brief history of the group. The monstrous restoration (at p. 275) of *Cheirotherium Anglorum* (why attributed to the *English* we do not know) is enough to frighten even naturalists themselves. We saw it once figuring in some book of popular geology, and shut the book at once. Birds appear in Lecture XII., as far, at least, as the Connecticut foot-prints and the Moa are concerned—not much for 1862, seeing that bird-bones had then been recognized in the Trias (North Carolina), the Stonesfield Oolite, the Wealden, the Upper Greensand, and many Tertiary beds. We must correct two statements made, at p. 282: first, the great fossil foot-prints at Hastings are Reptilian and not Ornithic; secondly, Dr. Mantell found only one or two Wealden bird-bones, not "many." The *Echinozoa* then have a few pages of classification and useful remarks, the Lecture ending with a wholesome caution to those who are fond of theorizing instead of collecting facts; and this seems to be offered by the author especially to those who see any evidence of the progression theory in the early appearance of the fixed Crinoids and the later predominance of the free Asteroids and Echinoids. Students will be glad of Lecture XIII. with its classificatory notices of Cephalopods and Bivalves, short as they are. *Oldhamia*, classed with *Polyzoa* on little or no evidence (it is either a Seaweed or a Sertularian), has more cuts than text; and *Graptolithus* (most probably a Sertularian) is grouped with them, and has but short shrift.

Lecture XIV., on fossil Mammals, has their classification for its basis. The "Mastozoic Epoch" of the author seems to have extended from the so-called Miocene to the Glacial period (*Dinotherium* and *Sivatherium*, the Mammoth and Megaceros, being some of the characteristic mammals). The next epoch is his "Anthropozoic;" and he says that the connecting links between these two epochs "are nowhere to be found." Surely the Camel and Giraffe are fossil in the Sivalik Hills with the Dinothere and Sivathere; surely Man and his works were contemporaneous with the old Ele-

phant and the Irish Elk. Dr. H. Falconer has said that fossil Man will yet be found in Nature's great Sivalik cemetery, and at other places where, together with the great apes, he could exist, whether in Miocene or even earlier times, under tropical or sub-tropical conditions. We must wait. Alas that philosophers cannot profit by the cautions they give to others! Here our author definitely limits Man's existence to the post-Tertiary period, accepting negative evidence, too impatient to wait for coming facts, and more easily impressed with the "vague analogy" of Greek succeeding Assyrian, or the Roman the Hebrew, than willing to see that, as Mammals existed before his "Mastozoic Epoch," so remains of Man may well be looked for in strata older than those of his "Anthropozoic Epoch."

The last Lecture is an honest and "conservative" exposition of the author's views of the history of life on the globe; he compares Combe's 'Vestiges of Creation' with the philosophy of Lamarck and Darwin, and he rejects them all, preferring to "remain contented with the very old-fashioned, but very simple and very satisfactory, hypothesis of a Creator."

Altogether this is a remarkable book, good for geologists to read; by no means a "Manual," it is really a valuable series of Lectures on Palæontology, preceded by some on Geognosy, and enriched with the results of Prof. Haughton's labours in chemical geology, his masterly thoughts on cosmical subjects, his earnest philosophy, his clever mathematical researches, his genuine classical knowledge, and his pains-taking acknowledgment of what is due to the patriarchs of science. There are graces and virtues here which are rare enough in the majority of geological treatises, and which outweigh the deteriorating effect of rather too much egotism. It must have been a strong belief in the value of these lectures, in a philosophic point of view, that induced the author to present them, for the use of students, without even a footnote or an appendix to tell them of the three years' added knowledge. There is no note of the disentanglement of the Metamorphic or so-called "Azoic" rocks, and of the consequent disappearance of the "systems" of slates and gneiss from the geological class-room, no mention of *Archæopteryx* (the reptilian bird), nor any account of fossil works of man; and there are several shortcomings in the author's knowledge of natural history and geology. That additions might have been made, the introduction of the curious, but extremely doubtful, marsupialism of the Dinothere, at p. 333, makes evident; and appendices might have been still added. Possibly a new edition will take a new shape; and, incorporating and correcting, it will certainly form a highly valuable treatise, not so comprehensive as a real manual, not so cosmopolitan and independent of party principles; but, based on good ideas, and imbued with the author's own style of thought, it will treat of the globe as Haughton will have taught us to think of it,—it will treat of life on the globe as represented by the myriads of mingled created forms, distinct and yet united, independent portions of one great whole, related by analogies and homologies, separable in their degrees of symmetry and of

complexity, of vital power, of instinct, and of intelligence, and all pointing to one Creative System, by whatever form of words we may try to define it.

Essay on the Trees and Shrubs of the Ancients; being the substance of four Lectures delivered before the University of Oxford. By C. Daubeny, M.D., Professor of Botany and Rural Economy. Oxford, 1865.

The subject to which these lectures were devoted has long excited the curiosity of botanists, from its historical interest and also from its difficulty. The unscientific reader of the classical authors has probably no idea that the identification of the plants there named with those of our own or other northern countries is, to say the least, uncertain and unsatisfactory.

The fruit-trees have perhaps been determined with tolerable correctness, and their names properly translated by the ordinary lexicographers; for they are mostly (as we learn from Pliny) introduced plants even in Italy: the Peach from Persia, the Quince from Crete, the Damson from Damascus, and so on. Even the Cherry is stated by him to have come from Pontus. In most of these cases, doubtless he was correct; and perhaps even the cultivated Cherry may have been introduced, just as the cultivated Hop is in England, the wild Cherry and the wild Hop having in both cases escaped the unobservant people of the periods recorded for their introduction into the respective countries.

Dr. Daubeny seems to think that the only fruits indigenous to Italy were the Mulberry, Apple, Pear, Plum, and Sorb.

It is even more difficult properly to apply the classical names to the forest-trees than to the fruit-trees. Let us take the *Fagus* or Beech as an example. It is stated by Cæsar not to inhabit Britain; and, indeed, Dr. Daubeny seems to consider it to have been introduced to our country not earlier than the Norman conquest; but surely he must have forgotten the extensive woods formed of this tree which now or recently existed in the chalky parts of the country. It is quite likely that Cæsar did not see the Beech in Britain, for he does not seem to have penetrated to the districts wooded by it; and there is also the confusion between the φηγός of Theophrastus and *Fagus* of Pliny to be remembered. The former may have been the *Quercus æsculus*; the latter correspond with the ὀξύη of Theophrastus.

The following extract will show the elaborate and exhaustive manner in which these curious questions are treated in the present book. On the tribe of Firs stated by Pliny to be pitch-bearing Dr. Daubeny says:—

"These Pliny divides into *Abies* and *Pinus*: and modern botanists, having separated the *Abietinæ* into two groups—namely, the one with leaves solitary or in two ranks, the other in clusters of two, three, or five each—place the former under the head of *Abies*, and the latter under that of *Pinus*.