containing copper ore, metallic copper being found at the back of the lodes, produced by the decomposition of the ore and precipitation of copper, as in the electrotype process,—from the same cause carbonate of lead was common at the tops of lead lodes. The case with gold was different; gold could not decompose or drift far, and must sink down amongst the detritus of the original rocks and remain near the shore. He considered that the fact of gold being most abundant in the older rocks was owing to the fact of those being the rocks most frequently in the requisite mineral and physical conditions.—Mr. C. DARWIN stated that he had visited a gold mine on the east side of the Cordillera, in rocks much newer than the Neocomian series; the mines were poor, but the comparatively modern origin of the rocks was indubitable.—Sir R. MURCHISON, in reply, observed that he believed all *rich* gold veins were confined to the older Palæozoic rocks, but his observations did not relate to the occurrence of minute quantities.

'Report on the Statical and Dynamical Facts of Earthquakes,' by R. MALLETT.—The Report commences with a *résumé* of the literature of the subject, and of the past theories of their origin, divisible into two classes:—those which attributed them to atmospheric agents, and those which supposed a cause operating beneath the surface. From the consideration of all the existing records, the following propositions are (provisionally) enunciated:—1. Earthquakes occur over all parts of the earth's surface, both on land and under the ocean. 2. They occur at all times, at all seasons, and at all hours of the day and night. 3. There seems no sufficient ground for supposing that they have operated more frequently or with greater intensity during one portion of past time than at any other. 4. Or that one part of the earth's surface has always been more liable to them than another. 5. But those regions which surround the present great centres and lines of volcanic action do appear to be now most subject to earthquakes. 6. And earthquakes are most prevalent and most violent in proportion to the activity and intensity of volcanic action in those regions at given times. 7. Many regions which are not now, nor present any appearance of having been, theatres of volcanic action, are subject to very frequent earthquakes. 8. Regions of extinct volcanic action do not appear more subject now to earthquakes than others altogether non-volcanic. 9. Although active volcanic regions are not frequently affected by earthquakes, yet the *most violent* recorded earthquakes appear to have convulsed regions lying some degrees away from the nearest volcanic centre. 10. And in general the most violent earthquakes have occurred upon the sea-coasts, or not far inland; some doubt, however, hangs over this in connexion with very ancient earthquakes in Asia. 11. Earthquake shocks have been felt on the ocean at vast distances from any land; and in some cases they have been nearly vertical in places where the depth was profound, and no phenomena occurred at the surface of the ocean indicative of volcanic action beneath. 12. The earth-wave or shock is a motion of great velocity, and occurring during a short moment of time at any given spot. 13. The total duration of motion at a given spot varies indefinitely, or between limits which have not been ascertained. 14. The absolute area convulsed at one earthquake epoch varies within indeterminate limits, and is related apparently to the maximum force of the shock in its extent. 15. The shock, or earth-wave, is a true undulation of the solid crust of the earth. 16. The undulation, which constitutes the earth-wave, has a real motion of translation. 17. The direction of translation of the earth-wave varies from vertically upwards to nearly horizontally in any azimuth. *a*, Shocks felt at great distances from their origin are nearly horizontal in transit; *b*, Within a certain radius round the origin they are sensibly inclined in transit; *c*, Some of the most destructive have emerged vertically; *d*, The direction of transit often varies during one earthquake; *e*, Two shocks may arrive nearly simultaneously at the same point with different transit directions. 18. The motion of translation of the earth-wave is rectilinear, and not curvilinear. 19. It has in all cases a true wave form upon the surface, and when its direction is nearly horizontal, the crest of the wave advances along a given line and parallel to itself. 20. The earth-wave has determinate dimensions in height and breadth, dependent on the force of the original impulse. 21. The velocity of its transit has not yet been determined by observation or experiment; it is proved, however, to be immense, and dependent on the elasticity and density of the formations through which it passes. 22. The direction and velocity of transit change occasionally in passing from the boundary of one formation to another. 23. Earthquakes occur which are accompanied by various sounds having a subterraneous origin, which sounds may either precede, accompany, or succeed—or occur both before, during and after—the shocks, or some of them; other earthquakes, of the greatest violence, are unaccompanied by any sounds whatever. 24. When the centre of impulse of an earthquake is under the sea, and within a certain (usually a comparatively small) distance of the land—the sea, at about the moment the shock is felt along the shore, retires slightly, and then again rolls in as the great sea-wave of translation, at a certain interval after the shock, depending on the distance of the centre of impulse.

Earthquakes, however great, are incapable of producing any permanent elevation or depression upon the surface of the earth by their direct action. But by their secondary effects they change it in various ways, thus: 1. Vast land-slips take place. 2. New lakes and river-courses are formed and old ones obliterated. 3. New valleys are hollowed out. 4. Fissures of various sizes are formed; in rocks or buildings by direct action; in incoherent or loose materials by subsidence or lateral disturbance, by the action of water. 5. At the moment fissures are formed fire and smoke (apparently) have been observed to issue. 6. Water often spouts from fissures, wells and springs burst up unexpectedly from the ground at the moment of the shock. 7. The great sea-wave when it comes ashore after the earthquake produces all the effects of a great debacle.

The report then proceeds with the relation to earthquakes of, 1st, the weather generally and the predictive effects on animals; 2, the barometer; 3, the thermometer; 4, the rain-gauge; 5, the electrometer; 6, the magnetometer; 7, the aurora,—both during long periods antecedent to the earthquake, immediately prior to it, and as modified subsequently by the effects of the earthquake. It then treats of the nature of the impulse producing originally the earthquake shock; and concludes with stating some of the most important desiderata of earthquake knowledge, viz.:—1, Large determinations of the moduli of elasticity of the substances forming the crust of the earth; 2, systematic and connected observations with self-registering seismometers of the direction and other elements of earthquake shocks; 3, direct experiments as to the rate of transit through the various formations of the earth's crust of the shock when artificially produced, to be measured by the author's seismoscope.

SECTION D.—NATURAL HISTORY, INCLUDING PHYSIOLOGY.

'On the Occurrence on the British Coast of a Burrowing Barnacle, being a type of a new order of the class Cirripedia,' by Mr. A. HANCOCK.—The animal which was the subject of this paper is called by the author *Alcippe lampas*. It inhabits the dead shells of various species of mollusca, which it appears to penetrate, and constructs for itself a residence by some process of boring. The author had an opportunity of watching its developement from the egg; and during the early parts of its existence it presented all the characters of many of the forms of entomostracous Crustacea. The author made some remarks on the relation of this animal to the other orders of Cirripedes, and proposed to constitute for it a new order which he called Cryptosomata. The paper was illustrated by drawings of the animal and dissections of some of its parts.

Mr. DARWIN remarked that having been employed for a considerable time in drawing up a monograph on the Cirripeda for publication by the Ray Society, he felt great interest in Mr. Hancock's paper—more especially as he had collected in South America an allied form, inhabiting cavities in the *Concholepas Peruviana*. Its main affinity to the genus described by Mr. Hancock lies in the number and position of the cirri and the great developement of the labrum:—the metamorphosis and organs of generation appear to be considerably different. Mr. Darwin stated that he possessed the type of another and quite distinct order of Cirripedes, entirely destitute of any shell, covering, or peduncle, without cirri, and with a suctorial mouth of very peculiar structure. Having remarked on the vast external differences between the common cirripedes and such forms as the last mentioned and that described by Mr. Hancock, and that inhabiting the Concholepas, Mr. Darwin stated that the main and unfailing character of a cirripede consists in the manner in which it becomes attached to foreign bodies. This is effected at first by the voluntary act of the larva, or more strictly pupa; afterwards a thick fluid or soft tissue debouches by the penultimate or ultimate segment of the prehensile antennæ, and so permanently attaches them to the surface: the antennæ are thus preserved, whilst all the other external organs of the pupa are moulted and lost. During the continued growth of the cirripede, the cementing substance in many genera is emitted from fresh orifices placed symmetrically round, but further and further from the centre of the basis. The most remarkable circumstance with respect to this cementing substance is that it is certainly secreted from glands which are actually continuous portions of the branching ovarian tubes or cæca. Finally, Mr. Darwin observed, that had Mr. Hancock examined specimens, instead of drawings, of the Lithotria in the rock, he would almost certainly have acknowledged its power of excavating cavities.—Prof. MILNE-EDWARDS suggested that the secretion by which the cirripedes were enabled to attach themselves to foreign bodies was produced by a gland at the base of the antennæ, similar to that which occurs in some species of macrourous Crustacea.—Mr. DARWIN in reply stated that the gland in the cirripedes was truly ovarial.—Prof. ALLMAN referred to the instance of a burrowing barnacle which had been discovered in the shells of some turtles brought from the West Indies, and described by the Rev. W. Hincks. It was a large species, measuring an inch and three-quarters.—Mr. JEFFREYS inquired if the cirripedes were in the habit of moulting.—Mr. DARWIN stated that their life was very active and their changes frequent, and some species moulted twice in a week.—Dr. MACDONALD thought that the structure of Mr. Hancock's animal and its earlier changes would throw some light on the structure of Trilobites.

'Notes on the Boring of Marine Animals,' by C. S. BATE.—The object was to prove that the perforations of certain mollusca and annelides into calcareous bodies were effected through the agency of "free carbonic acid held in solution by sea water;" the economy of boring animals being simple and uniform in their kind throughout creation, being only instruments directing the solvent more rapidly to a given point, this being done chiefly through the process of respiration and ciliary currents. He drew attention to the disintegration of limestone rocks when exposed to the long-continued action of the sea, and exhibited some rolled pebbles which, according to the character of perforation, he separated into three classes:—First, those penetrated by minute dichotomous holes, attributed to the power of certain annelids, previous to the pebble having been fractured from the solid rock. Second, in which the holes were externally cylindrical, but internally worn into many irregular channels, from having been originally perforated by annelids, which opened for the action of the sea a passage to the centre of the stone, which by continual rolling would give a fresh direction and a new impetus to the affinities existing between the corroding material and carbonate of lime, and consequently extensive internal excavation would be the result. Third, those having passed more or less through the two former stages, and become fixed and partially protected by accidental causes show not holes, but large, small and imperfect depressions.—The author's experience went to show that the power which Saxicavæ possess of boring rocks has been much overrated; he thought that their capacity to penetrate ceased while they are very young, that they bore only during the period that they possess a foot sufficiently strong for locomotion, after which excavation only continues adapted for their increasing growth. To show this, he pointed to the fact that whilst the entrance first made under the direct influence of the Saxicava-