'On Artificial Gems,' by M. EBELMEN.—This was merely a note accompanying some specimens of artificial gems prepared by M. Ebelmen under the influences of heat and pressure, as described in his communications to the Academy of Sciences of Paris.

'On a New Method of determining the Organic Matter in Water,' by Prof. FORCHHAMMER.—The test which he applies is hypermanganesiate of potash or soda,—which he prepares in this way. He heats the hydrate of potash or soda with chlorate of potash and the peroxide of manganese, according to the method of Wöhler. After heating, the salt is thrown into water, and so much diluted muriatic acid is added that it assumes a bluish red colour,—upon which carbonic acid gas is let through, until the colour has become bright red, and the manganesiate of potash completely converted into hypermanganesiate. The liquid must be cleared, either by allowing it to deposit all the oxide of manganese, or by filtering it through asbestos. This liquid may be kept for a very long time unaltered in a glass vessel with a glass stopper. The next process is to ascertain the strength of the test,—which is done by taking any determined measure of it, mixing it with water and a little alcohol, and then heating it. All the manganese is thrown down, and after being washed and exposed to a strong red heat, it is the compound oxide of manganese, 3 Mn + 4 O. This test is now applied in such a way that, for instance, one pound of the water which is to be tried is mixed with a small quantity of the test and boiled. If the colour has disappeared, another quantity is added, and the liquor again boiled, until, in going on in that way, the red colour of the liquid does not disappear any longer. After that, it is allowed to cool,—and then the quantity of hypermanganesiate of potash, which has not been decomposed for want of organic matter in the water, is determined by comparing its colour with distilled water; to which have been added very small determined quantities of the test solution. If the quantity of the test which is thus added in excess is subtracted from the whole quantity which has been used, the real quantity of decomposed hypermanganesic acid is determined, and thus also the quantity of organic matter itself. This method is liable to one fault,—viz. that the nature of the organic matter may be different, and accordingly require different quantities of the test liquor to be decomposed. But the organic matter which generally occurs in water is approaching almost always to humic acid, and thus the determination of the organic matter allows it to be compared. As to that part of the organic matter in water which contains nitrogen, the author thinks that he has found out a method for determining it by itself; but not having yet finished his experiments on that point, he must leave it out of the question. Water taken from a greensand spring about twelve miles from Copenhagen contained so little organic matter that one pound only required six measures of a test solution, of which 100 measures contained the manganese of 0·526 of the double oxide of manganese; while water taken from a lake which communicates with a peat moss required 1 lb. 74 measures of the same liquor. Prof. Forchhammer, continuing for a whole year every week this analysis of the water which is used for supplying Copenhagen, observed the following facts:—1st. The quantity of organic matter is greatest in summer. 2nd. It disappears for the most part as soon as the water freezes. 3rd. Its quantity is diminished by rain. 4th. Its quantity is diminished if the water has to run a long way in open channels.

Mr. WEST asked if all organic substances were oxidized by the salt in question.—Prof. FORCHHAMMER replied, that nitrogenous organic matters occasioned a precipitate by chloride of gold,—which precipitate, on analyzing according to the ordinary method, gave ammonia. But whether or not all the nitrogen was thus thrown down he had not yet determined.—Some further conversation ensued, in which Dr. Faraday, Prof. Rogers, and Dr. Daubeny took part.

[It might appear from the construction of the sentence in our report of the conversation which ensued upon reading Dr. Scoffern's paper [*ante*, p. 935], that the galvanic process had been employed in that gentleman's process of refining sugar. We are requested to state that he does not employ it.]

Birmingham, Sept. 13.

Permit me to direct your attention to one portion of your report on my paper read at the British Association,—a portion which, as it stands, would seem to imply a remark of Dr. Faraday adverse to my operation,—which was not the case. I was asked by a member, whom I did not recognize, whether I could offer any opinion as to the practicability of removing lead from solutions of sugar by means of the galvanic agency,—not *in* my process, but in contradistinction *to* my process. I replied, that a refiner, who had tried this means of removal, informed me it did not answer. Whereupon, Dr. Faraday expressed his opinion that the galvanic agency, however applied to such purpose, never would answer. As the use of voltaic electricity is no part whatever of my process—indeed, is one concerning which my opinions are entirely in accordance with those of Prof. Faraday—you will readily see how desirous I am of placing the matter in its true light. I have, &c. J. SCOFFERN.

SECTION C.—GEOLOGY AND PHYSICAL GEOGRAPHY.

'On the Distribution of Gold Ore over the Earth's Surface, and on the Structure of California, as compared with that of the Ural Mountains,' by Sir R. I. MURCHISON.—The author exhibited an enlarged Mercator's projection of the World, taken in great part from a general sketch-map, by M. A. Erman of Berlin, on which all the leading ridges affording gold ore in times past or present were marked, also an enlargement of the map of California by M. Erman, and his own large map of Russia, and sections in the gold-district of the Ural. After referring to the works of Humboldt and others, Sir Roderick gave a condensed view of his own observations on the gold region of the Ural Mountains, which had led him to form the opinion, that gold veins had generally been produced where certain rocks of intrusive character, viz., greenstones, porphyries, sienite, granites and serpentines, had been intruded through palæozoic rocks, particularly as respects the Ural, among those of the Silurian epoch. It is, in short, where clay slates, limestones, and greywacke sandstones have been penetrated by such igneous rocks that quartz veins abound, and with them a diffusion of gold ore in grains, leaf and veins. All the phenomena of Siberia to the East of his own observations are lithologically and geologically similar to those of the Ural. To the general view of Baron von Humboldt, that the richest gold deposits are those which are derived from ridges having a meridian direction, M. A. Erman is decidedly opposed; but Sir Roderick is of opinion, that although we may be unable to explain the cause, it is a fact that the greatest quantity of gold ore has been obtained from chains having a nearer relation to north and south than to equatorial or east and west directions, due perhaps to the general form of the chief masses of land, and the prevailing strike of the Palæozoic rocks. He next pointed out the error into which some persons had fallen, of supposing that the Uralian mines were worked underground; the only small subterraneous work being one near Ekaterinburg, which affords a very slight profit. All the other mines along that north and south chain, throughout 8° of north latitude, are simply diggings and washings which are made in the detritus or shingle accumulated on the slopes of the ridges and in the adjacent valleys, and with one exception are all upon the east side of the range. This phenomenon in the Ural Mountains is a necessary result of their structure; the older deposits through which the eruptive rocks have risen constituting chiefly the crest and eastern slopes of the chain, whilst the western slopes are occupied by deposits of younger or Permian age. As the conglomerates and detritus of the latter rock contain no traces of gold, though they abound in copper ores, it was pointed out in the work on Russia that the auriferous veins were produced after the accumulation of the Permian system. Comparing California with the Ural, Sir Roderick showed that there was a very great coincidence of mineralogical structure, and that with these *constants* the same results obtained; the chief distinction consisting in the apparently larger proportion of gold in the detritus of the newly-discovered deposits in California than in those of the Ural. He contended, however, against the inference that any large tract of California would be found to be as uniformly auriferous as the banks and slopes of the upper tributaries of the Sacramento. That gold ore has been found from latitude 36° to latitude 40° along the western slope of the Sierra Nevada is admitted, but the longitudinal extension or breadth of the auriferous detritus of California has yet to be ascertained. At, however, the lower or coast ridge which passes by San Francisco seems to be in miniature what the higher parallel mountains are upon a larger scale, in being composed of greenstones, porphyries, greywacke sandstones and quartz rocks, it is probable that very much of the great intervening valley of the Sacramento may be strewed over *at intervals* with auriferous debris. And here the author took some pains to indicate the distinctions between all such surface mining operations as those of Siberia, California, and the Brazils, and those works in which besides the ores of silver, copper, &c. gold also had been extracted from the veins in the solid or parent rock, as in Mexico and many other parts of the world, and in such cases the nobler metal is usually associated with amalgam of other ore, which renders its extraction very costly. In adverting to the remarkable fact, that when found in superficial detritus the associated ores of the parent veinstone have disappeared, he accounted for this phenomenon by the oxidation and wear of the other metals, and the resistance of gold and its frequent accompaniment, platinum, to such action, and to their superior weight, which had enabled them to withstand the strong action of former denudation like the quartz veins of the original matrix. Adverting to the facts that in the Ural Mountains, where little or no admixture with other ores existed, the veinstones "in situ," have proved very slightly remunerative when worked further downwards, he glanced at a view of Humboldt, who, looking to the great lumps or "pepites" occasionally found in the surface rubbish, supposed that there may have been some connexion between the production of gold and the atmosphere; since judging from these specimens it was from the superficial extremity of these quartz veins that the richest branches of gold must have been derived; the veinstones when followed downwards having usually proved unproductive. As, however, there are cases (chiefly on a small scale, as in Hungary) where gold ore continues to ramify in veinstones of great depths beneath the surface, the author contents himself with dwelling upon the important statistical fact, that all the great masses of gold ore have been and are derived from superficial rubbish; the major part of this detritus he carefully distinguishes from modern alluvia, and shows that it has been the result of former and more powerful causes of degradation than those now in operation—causes which distributed coarse shingle and blocks and sand, with occasional large lumps of gold, and wearing away all the associated schists, and the most oxidizable ones, left only the harder rocks, particularly the quartz veins, together with the harder, purer and nobler metals, gold and platinum. The existing rivers have little more to do with this phenomenon than that in mountainous tracts, and where they have a rapid descent, they have laid bare the edge of the previously formed gold accumulations. By this observation it is not meant to deny, that where existing streams flow directly from rocks "in situ," which are now impregnated with gold, auriferous detritus must not naturally be the result, but simply to prevent the student who may refer to detailed maps of gold tracts from imagining that the rivers are auriferous except when they derive that quality from the wearing away and breaking down of the mixed materials which constitute their banks. In a word, British geologists may be assured, that gold shingle and sand have been accumulated just in the same manner as the former local drifts of their own country, and that in both, bones of mammoths, rhinoceros and extinct quadrupeds occur. Having terminated his account of the geological constants which accompany gold mines in Europe, Asia and America, Sir Roderick then traced the history of gold and its developement as known to the ancients and our ancestors of the middle ages. He showed that in all regions where rocks similar to those he had described occurred, there gold had been found in more or less quantities, and that just in proportion to the time that a country had been civilized had the extraction and produce of the precious metal diminished; so that in many tracts where it formerly prevailed to some extent, it had been either worked out or the mines have been almost forgotten. Briefly alluding to the examples at home of gold works in Wales under the Romans, where Silurian rocks are

pierced by trap and contain veinstones as described by himself, and to the former gold of Scotland and Ireland, and its occasional discovery in the detritus of the county of Wicklow, and its diffusion in some of the oldest strata of Merionethshire. He particularly dwelt on the Continental tracts formerly so rich, as cited by Strabo, all of which, with the exception of the north Ural or country of the Arimaspes, from whence the Scythian ores came, were no longer gold bearing districts. The Scythian or Uralian tract had, in fact, remained unknown and unattended to from the classical age until this century, and so completely ignorant were the modern Russians of the existence of gold in the Ural Mountains, or that they had in their hands the country which supplied so much gold to Greece and Rome, that excellent German miners had long worked the iron and copper mines of that chain before any gold veins were discovered. These also were worked as solid veins in the rock for some time before the accidental discovery of a small per-centage of gold ore in the ancient alluvium or drift led to the superficial diggings, which produced at an infinitely less expense ten times the amount of produce of the mines in the solid rock near Ekaterinburg. All the energy displayed by the Russian miners having failed to augment the amount of Uralian gold, and as it has never much exceeded half a million sterling, the period is gradually arriving when the local depressions or basins of auriferous detritus of that region will be successively dug and washed out, and the Ural will then resemble many other countries in possessing actual mines of iron and copper, but merely a history of its gold. Russia, however, has also the golden key of all eastern Siberia, in which various offsets from the Altai chain, and chiefly those which, separating the rivers Lena, Jenisei, &c. stretch along the shores of the Baikal Lake, and have proved so very productive, that for some years they have afforded a greater supply of gold (three millions sterling average, exclusive of the Ural) than all the other gold bearing countries of the world. As in the Ural Mountains, so in California, notwithstanding their keen scent for gold from the days of Columbus to the present time, the Spaniards never knew of its existence in the valley of the Sacramento, which tract they left in quiet possession of the native Indians; and it was only by the recent accident of the breaking away of a bank of detritus by a mill-race that this region was opened out for the first time to the new colonists of the Anglo-Saxon race. What, then, is to be the value and duration of these Californian mines? On the point of absolute value the author does not venture in the absence of sufficient facts and statistical data, but in regard to the duration of the mining ground of California, he speculates that if it be locally so much richer than the similarly constituted detritus in the Ural, still there is nothing to interfere with the belief founded on all past experience, that with the activity now employed in the works they may not be neglected or abandoned in a given time. The very great per-centage of gold ore in the valleys of the Sacramento seems to indicate that the most valuable portions of the original veins have been ground down by former powerful denuding agencies; and as the rule obtains very greatly in mining, that the richer the veins the less are they likely to be spread over a large mass of parent rock, so is he disposed to think, that it will only be in certain patches that very great wealth will be discovered, and hence that it would be hasty to conclude that because rich gold detritus has been discovered near the sources of the Sacramento in lat. 40°, and also on the river Colorado in lat. 34° 5′, that all the intermediate tract of country (of 4 degrees of lat. and 1 of long.) should prove equally productive. Considering the vast addition in the few last years of nearly four millions sterling per annum made to the European market by the researches in Siberia, and seeing how little effect such addition has produced in the value of gold, the author is of opinion that the Californian discovery is not likely to produce any material disturbance in the standard. At the same time he expresses his full agreement with M. Erman and others, that with the advancement of colonization in the central regions of North Asia and other parts of the world where civilization has not yet extended, other gold tracts may be discovered wherever the geological and lithological constants to which he has adverted occur; but neither would this circumstance induce him to fear that such discoveries (which can only take place at long intervals of time) will more than compensate for the wear and tear of the precious metal, and supply the wants of the rapidly increasing population, and more highly advanced state of civilization. Sir Roderick then briefly alluded to the erroneous opinion of old authors, that the origin and production of gold had any reference whatever to hot or equatorial climates, as testified by the abundance of ore in Siberia even up to 67° north lat., and cited a table by M. Erman which showed that by far the greatest quantity occurred in northern latitudes, there being every probability, according to that author, that much more of the ore may be discovered in the northern prolongation of the American chains, and in the frozen regions of Russian America, just as he had discovered in ridges of the far north-east of Siberia, and near to Kamschatka. He reminded his geological auditors, that in considering the composition of the chief or eastern ridge of Australia and its direction from north to south, he had foretold (as well as Colonel Helmersen of the Russian Imperial Mines) that gold would be found in it, and he stated that in the last year one gentleman resident in Sydney who had read what he had written and spoken on this point, had sent him specimens of gold ore found in the Blue Mountains, whilst from another source he had learned that the parallel north and south ridge in the Adelaide region, which had yielded so much copper, had also given undoubted signs of gold ore. The operation of the English laws by which noble metals lapse to the Crown, had induced Sir Roderick Murchison to represent to Her Majesty's Secretary of State that no colonists would bestir themselves in gold mining if some clear declaration on the subject were not made; but as no measures on this head seem to be in contemplation, he infers that the Government may be of opinion, that the discovery of any notable quantity of gold might derange the stability and regular industry of a great colony, which eventually must depend upon its agricultural products. A periodic discovery like that in California may indeed in the hands of adventurous and unbridled speculators, force a considerable quantity of surface gold so suddenly upon the market, that a momentary apprehension of a great change in its relative value may be entertained; but looking to the mineralogical and geological structure of America, and seeing how large a portion of that continent is made up of rocks precisely similar to those which have afforded the gold shingle and sand of the Sacramento, and knowing that all the other far-famed gold districts of the New World have had assignable limits in their productive capacities, and that many of their sources have disappeared or become valueless, he believes that the time will come when the rich soil of the valleys of California, like that of the banks of the Rhine, the Guadalquivir and the rivers of Bohemia, will alone be turned up by the plough, or serve as pasture lands, to the entire abandonment of gold hunting.

The PRESIDENT confirmed the statement of Sir R. Murchison, that little advantage had ever been gained by mining the solid rocks containing gold; the deposits from which it was obtained consisted of the detritus of these rocks produced by the action of the sea in former ages; they were not mere river beds now in process of formation, but portions of that wide spread drift, containing frequently the bones of the mammoth and other extinct animals, which is found also in this country. He did not consider the evidence conclusive, either that there was most gold near the surface of the auriferous rocks, or that the auriferous chains were mostly meridional.—Prof. W. ROGERS stated that the position and relations of the gold ore in the United States, occurring principally in Virginia and Carolina, had been ascertained in the course of the Government surveys; the gold was uniformly associated with or imbedded in quartz rock, forming veins in the talcose and micaceous schists and altered sandstones. Gold was once procured there in such abundance and with such facility as to create an interest almost equal to that of California in the public mind: so long as the operations were restricted to washing the detritus of the valleys and principal streams, the produce was abundant and largely repaid the labour; but these comparatively superficial deposits were often very rapidly exhausted from the wasteful mode of conducting the works, and as soon as mining in the solid rock was attempted, an almost universal destruction of the mining societies took place, producing very extensive disasters, and finally amounting to a serious public calamity. It was probable that this difficulty in obtaining gold by mining was universal, and continued at all depths; it was partly owing to the association of the gold, in solid rocks, with iron pyrites and ores of copper and lead, so blended as to cause great difficulty and expense in separating them; near the surface of the rocks this process seemed to have been accomplished by atmospheric agency, for it was impossible to suppose that the gold was originally most pure and abundant over what is now the surface. From the decomposition of these metallic ores the auriferous quartz of the United States is known as "honeycomb" quartz, or by the miners as "bloom of gold," since it occurs scattered over the surface where the gold-producing veins exist. The general trend of the old metamorphic rocks in the United States is north-east by south-west, and the gold veins conform to this general direction, being frequently interposed between the strata instead of crossing them. Gold had been found at intervals all the way from Lower Canada to Central Georgia, a distance of 1,000 miles, and although insignificant in quantity, as compared with California, it occurred under the same conditions. Prof. Rogers was of opinion that after a few years the amount of gold obtained in California will greatly decline, without having inundated the world to such an extent as the hopes or apprehensions of some have led them to suppose.—Prof. SEDGWICK contended that the *age* of the rocks was not a *constant* phenomenon in connexion with gold, but that the *condition* of the rocks did appear to be constant; in the Alps, lias and still more modern rocks were seen passing into the condition usually characteristic of the "primitive," but such instances were extremely rare: in this country gold was found in the Devonian rocks of St. Austell, as well as in the granite of Shap Fells. Prof. Sedgwick also disputed Humboldt's generalization upon the direction of auriferous chains, which were not generally north and south any more than mountain chains were mostly north and south. He then described the manner in which the tin ore is separated from the alluvial soil in Cornwall, by "jigging," or agitating it in a basket with water, by which the soil is washed away and the heavier ore remains; it was by a similar process, carried on upon a large scale, that nature formed the Californian gold-field; the Sierra Nevada had been agitated beneath the waves of the sea until thousands of feet of solid rock had been broken up, the lighter and more soluble materials carried far away, and the heavy particles of gold spread out with the detritus remaining in the valleys immediately below the hills. Such deposits could not be uniformly rich, and the most productive would probably be first discovered; there was no fear, however, of obtaining too great a quantity of gold,—the population of the world was increasing, and for whatever purposes gold was useful a larger quantity was required. The mode in which it was accumulated in particular countries ought to be considered as much a manifestation of the benevolence of Providence as the accumulation of coal in some countries to the exclusion of others, since, if the existing quantity were diffused over the whole globe, it would be lost beyond recovery, and cease to minister to the use of man.—Sir H. DE LA BECHE also argued that the mineral and physical conditions, rather than the age of the rock, were connected with the accumulation of any particular ore. The tin ore, formerly supposed to be confined to the most ancient rocks, was now known to abound in the equivalents of the coal measures. Gold veins must have been liable to be broken up and re-distributed in ancient times as well as more recently, and indeed much of the auriferous pyrites occurred in rocks which had once been mud, the grains of gold forming the nucleus around which the sulphuret of iron had formed. Most of the metallic ores had been deposited in hollows from a state of solution, and in some instances they occurred in isolated cavities, and must have passed through the pores of the rock like the pseudomorphous crystal of tin in cavities originally occupied by feldspar in the granite of Cornwall. Changes by atmospheric action were known to occur in lodes

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-