in his tent at the Botanic Gardens. A batch of new Doctors of Civil Law has been added to the illustrious roll, amongst whom Prof. Sedgwick was the unquestionable lion of the day. Talking of lions reminds us that the Red Lions have had their annual feed; this time under the presidency of Prof. Huxley. There have been excursions numberless; the students of Geology riding chiefly to Shotover; the lovers of Art chiefly to Blenheim. The Duke of Marlborough has paid the members of the British Association the delicate compliment of throwing open his noble grounds and galleries at the hours most convenient for their visits, and in cases where the proper applications have been made, of allowing the treasures of his private apartments to be inspected in the most liberal manner. Hundreds have accepted His Grace's generous invitation to Blenheim, where the grounds are in perfect beauty, and the glorious Raffaelles, Rubens', and Van Dycks have recently been arranged and noted by the accomplished hand of Mr. Scharf.

Yet the main interest of the week has unquestionably centred in the Sections, where the intellectual activities have sometimes breathed over the courtesies of life like a sou'-wester, cresting the waves of conversation with white and brilliant foam. The flash, and play, and collisions in these Sections have been as interesting and amusing to the audiences as the Battle at Farnborough or the Volunteer Review to the general British public. The Bishop of Oxford has been famous in these intellectual contests, but Dr. Whewell, Lord Talbot de Malahide, Prof. Sedgwick, Mr. Crawford, and Prof. Huxley have each found foemen worthy of their steel, and made their charges and countercharges very much to their own satisfaction and the delight of their respective friends. The chief cause of contention has been the new theory of the Development of Species by Natural Selection—a theory open—like the Zoological Gardens (from a particular cage in which it draws so many laughable illustrations)—to a good deal of personal quizzing, without, however, seriously crippling the usefulness of the physiological investigations on which it rests. The Bishop of Oxford came out strongly against a theory which holds it possible that man may be descended from an ape,—in which protest he is sustained by Prof. Owen, Sir Benjamin Brodie, Dr. Daubeny, and the most eminent naturalists assembled at Oxford. But others—conspicuous among these, Prof. Huxley—have expressed their willingness to accept, for themselves, as well as for their friends and enemies, all actual truths, even the last humiliating truth of a pedigree not registered in the Herald's College. The dispute has at least made Oxford uncommonly lively during the week.

Before commencing our abstract of the Sectional work we must give the brief—

Report of the Council.

1. The Council were instructed by the General Committee at Aberdeen to maintain the establishment at Kew Observatory by aid of a grant of 500*l*. They have received the following Report of the Committee to whom the working of the Observatory is entrusted.

2. The continuance of Magnetic Observations, at stations indicated by the General Committee at the Leeds Meeting, has engaged the attention of H.R.H. the President, and of the Council; and they have had the advantage of co-operation on the part of the President and Council of the Royal Society. Every means has been adopted for pressing the subject on the favourable attention of the Government, but, it is to be regretted, hitherto without success.

3. The importance of Telegraphic Communication between sea-ports of the British Isles, has been the subject of much attention since it was urged on the General Committee by the Aberdeen Meeting. The Council are happy to find that Admiral FitzRoy has been authorized to proceed in bringing to a practical issue the recommendations offered on this subject to the scientific department of the Board of Trade; and they congratulate the Association on the share they have taken in a cause so dear to humanity.

4. The expedition suggested by the Royal Geographical Society, and concurred in by the General Committee of the British Association, is on its way; Capt. Speke, under the direction of the Admiralty, with his assistant, Capt. Grant, having sailed from Zanzibar. Sir R. I. Murchison, in reporting on this subject, expresses the obligation which is felt by the promoters of this great step for the exploration of Africa, to Lord John Russell, Secretary of State for Foreign Affairs.

(The Report of the Parliamentary Committee is received for presentation to the General Committee this day.)

5. At the Meeting this day, in pursuance of the Notice placed in the Minutes of the General Committee at Aberdeen, it will be proposed—'That a permanent distinct Section of Anatomy and Physiology be established, in addition to that of Zoology and Botany.'

The Council are informed that Invitations will be presented to the General Committee at its Meeting on Monday, July 2, to hold the next Meeting in Manchester; on behalf of the Literary and Philosophical Society of Manchester, and other Institutions and Public Authorities of that city, from whom Invitations were received at previous Meetings.

Invitations will also be presented to hold an early Meeting in Newcastle, on behalf of the Council and Borough of Newcastle upon Tyne, and to hold a Meeting in Birmingham in 1862, on behalf of the Birmingham and Midland Institute.

Report of the Parliamentary Committee.

The Parliamentary Committee have the honour to report as follows:—No subject of sufficient importance to require any especial notice has occupied their attention during the past year, nor indeed was there any matter referred to them at the last Meeting of the Association. There are now either two or three vacancies in that portion of the Committee which represents the House of Commons, according as it shall be determined whether the vacancy caused in that section by Lord de Grey's taking his seat in the House of Lords is or is not to be filled up.

May 28, 1860. WROTTESLEY, Chairman.

Mr. NINNIS read

The General Treasurer's Account,

From September 14, 1859 (commencement of Aberdeen Meeting), to June 27, 1860 (at Oxford).

RECEIPTS.	£.	s.	d.
To Balance brought on from last Account ..	199	7	10
Life Compositions at Aberdeen and since..	299	0	0
Annual Subscriptions ditto ditto	600	2	0
Associates' Tickets ditto ditto ..	1,206	0	0
Ladies' ditto ditto ditto	821	0	0
Six Months' Dividend on 6,000*l*. 3 per cent. Stock	85	2	6
Interest on Cash from Bank at Aberdeen ..	14	2	9
From Sale of Publications—viz., for Reports of Meetings, 136*l*. 19*s*. 1*d*.; Catalogues of Stars, and Dove's Catalogue, 32*l*. 3*s*... ..	169	2	1
	£3,393	17	2

PAYMENTS.	£.	s.	d.
By paid expenses of Aberdeen Meeting, sundry Printing, Binding Reports, Advertising, and Incidental Payments by the General Treasurer and the Local Treasurers	465	7	9
Printing Report of the 28th Meeting ..	574	13	9
Engraving ditto 29th Meeting.. ..	41	11	0
Salaries, Twelve Months'	350	0	0
Subscriptions returned as per Resolution of the Council—Sir Thomas Gladstone, 1*l*.; Mr. Dyce Nicol, 1*l*.	2	0	0
Purchase of 500*l*., 3 per cent. Consols ..	474	7	6
Maintaining the Establishment of Kew Observatory	500	0	0
Dredging near Belfast	16	6	0
Dredging in Dublin Bay	15	0	0
Inquiry into the Performance of Steam-Vessels	124	0	0
Explorations in the Yellow Sandstone of Dura Den	20	0	0
Chemico-Mechanical Analysis of Rocks and Minerals..	25	0	0
Researches on the Growth of Plants ..	10	0	0
Researches on the Solubility of Salts.. ..	30	0	0
Researches on the Constituents of Manures	25	0	0
Balance of Captive Balloon Accounts ..	1	13	6
Balance at the Bankers £698 13 6			
Ditto in hand of the General Treasurer and Local Treasurer 20 4 2			
	718	17	8
	£3,393	17	2

SECTION A.—MATHEMATICAL AND PHYSICAL SCIENCE.

President—Rev. B. PRICE.

Vice-Presidents—Sir D. BREWSTER, Rev. Dr. LLOYD, Rev. R. MAIN, The MASTER OF TRINITY COLLEGE, CAMBRIDGE.

Secretaries—Prof. STEVELLY, Rev. T. RENNISON, Rev. G. C. BELL.

Committee—The Astronomer Royal, Prof. Adams, J. F. Bateman, Sir E. Belcher, W. R. Birt, Prof. Boole, Rev. Dr. Booth, C. Brooke, J. A. Broun, Rev. J. Carson, Dr. Caswell, A. Cayley, M. De la Rive, W. De la Rue, Prof. Draper, Rev. S. Earnshaw, Rev. N. F. Ferrers, Admiral FitzRoy, Dr. J. P. Gassiot, Dr. J. H. Gladstone, Prof. Graves, Sir W. Snow Harris, Prof. Hennessy, Rev. Dr. Hincks, Mr. Hodgson, Col. Sir H. James, Prof. Jellett, W. Lascelles, Dr Lee, Rev. Dr. Lloyd, Prof. C. Maxwell, Canon Moseley, J. Nasmyth, Prof. Peirce, Prof. Phillips, Gen. Portlock, Prof. Rankine, Rev. G. Salmon, M. von Schlagintweit, H. J. S. Smith, J. Sprague, W. Spottiswoode, B. Stewart, Prof. Stokes, G. J. Stoney, R. Thomas, M. Verdet, T. Kirkman, M. Lindelöf, Prof. Struve, Col. Sykes, Prof. Sylvester, Prof. Tyndall, Rev. R. Walker, Prof. Wheatstone, Prof. Willis, Lord Wrottesley, Dr. Winnecke.

THURSDAY.

The PRESIDENT of the Section, on taking the chair, addressed the Section in the following terms:—Gentlemen,—A custom has prevailed at our Meetings for some years, for the President of each Section to make a short address at the opening: the object of it I take to be twofold; first, to explain to new members the nature of the business which we have to transact; and, secondly, to suggest to all the course of procedure and the distribution of subject most convenient for the conduct of our business. The area of scientific research which this Section covers is very large,—larger, perhaps, than that of any other; and its subjects vary so much, that while to some of those who frequent this room certain papers may appear dull, yet to others they will be full of interest. There are many and very good reasons why these subjects should be grouped. Some of them possess, probably in the highest degree attainable by the human intellect, the characteristics of perfect and necessary science; while others are at present little more than a conglomeration of observations, made, indeed, with infinite skill and perseverance, and of the greatest value,—capable, probably, in time, of greater perfection, nay, perhaps, of most perfect forms,—but as yet in their infancy, scarcely indicating the process by which that maturity will be arrived at, and containing hardly the barest outline of their ultimate laws. We have, indeed, sciences intermediate to these two extremes, in which some of the laws are already capable of mathematical expression, and from which results have been derived; and still many phenomena are as yet not brought within their comprehension. But as all subjects which we consider in this Section are of one type, so are they rightly combined; and it will be, I venture to think, an evil day for natural knowledge when we cease to consider the forms of the sciences of space, number, and motion those to which all others ought to assimilate themselves. Now, first of all in our Section stand Mathematics, both pure and applied. These, indeed, require very long and arduous study, inasmuch as they have peculiar nomenclature, language, and processes; and thus it is only to the few generally who have made them their particular study, that they offer great interest. Mathematics have also now become so large in their grasp and so curious in their details, that I am, I am sure, only expressing the opinions of most analysts when I say, that the whole of a man's life is not sufficient for more than one branch of them. Indeed, now, and we are proud to say so, some members of this Association are devoting whole lives, and intellects too of the highest order, to the advancement of our knowledge in a particular direction. Take, for instance, the theory of homogeneous forms, in the history of science the names of Boole, Cayley, Sylvester, will always be recorded, and in scientific treatises their labours will find a place. Or take, again, the theory of elliptic functions, or the calculus of probabilities, the difficulties of these subjects require the utmost tension of the human mind, and even then they transcend its limits. To many of the usual attendants on this Section, these and kindred subjects may be dry and uninteresting. Well, if they are so to any of you, I must beg you to bear with us for a short time; these theories have a deep and pregnant meaning. And be assured, too, that they are not uninteresting to all: to many they give the purest pleasure, and I must ask you not to grudge them *that*, during the few papers on the higher mathematics which we shall probably have. In passing, too, I would remind you that very frequently our knowledge of natural phenomena depends on certain integrals, the properties of which can only be studied with a profound knowledge of the higher mathematics, and thus the progress of one branch of knowledge depends on, and is frequently stopped by our ignorance of, another. To most of us, probably, the questions of applied mathematics will have greater interest; we are more familiar with the laws of nature, the mathematical interpretation of which, mixed mathematics, as they are called, take cognizance of; we most eagerly catch at the results of those laws. Consider the Newtonian law of gravitation in its most general form, in its highest development in the Lunar and Planetary Theories; a dry mathematical paper will thin our room, an astronomical paper will often fill it, and now too, perhaps, more than heretofore, for our interest in the subject has been newly aroused of late. The lunar disturbances have been, as you know, calculated with greater precision than heretofore, and new results have been arrived at, which exhibit certain discrepancies relatively to the old. I need do no more than allude to what has lately taken place at our own Royal Astronomical Society and at the French Academy, and express a hope that we shall have some communication on the subject, from those who are here present and are well qualified to give it. Mathematicians, however, have been startled by an announce-

non-conducting substance, be interposed between electrodes in an electrolyte, so that there be no liquid communication around the edges, it is hardly necessary to say that, according to received opinions and experiments, no current passes, and no electrolysis takes place. Mr. Grove was led by some theoretic considerations to think that this rule might not be without an exception, and the following experiment realized his view:—A Florence flask well cleaned and dried was filled two-thirds full of distilled water, with a few drops of sulphuric acid added to it, and placed in an outer vessel, containing similar acidulated water, and which reached to the same height as the liquid in the interior. A platinum wire was passed through a glass tube, one end of which was hermetically sealed to the platinum, so that a small part of the wire projected beyond the tube. This tube passed through a cork fitted to the flask, and the platinum point dipped into the liquid within the flask, and a similar coated wire was dipped into the outer liquid, and the two wires connected with the extremities of the secondary coil of a Ruhmkorff's apparatus. Upon the latter being excited by the battery a stream of minute bubbles arose from both the platinum points, proving that electrolysis took place notwithstanding the interposition of the glass. The portions of the flask above the liquid both outside and inside were perfectly dry, so that there could have been no communication of the current over the surface of the glass. This was further proved by removing the outer wire a short distance from the liquid, when sparks passed nearly equal in length to those between wires from the terminals. As the outer wire was further removed, keeping it near the flask, sparks passed along the surface of the latter for a short distance; and as it was further removed from the liquid, still being near the flask, they ceased, thus showing that there was no passage of electricity over the upper and unwetted surface of the glass. With unacidulated water no electrolysis was observed, nor when a battery of thirty cells was used instead of Ruhmkorff's coil. In the first experiment the evolution of gas gradually diminished, and ceased in about twenty minutes, but recommenced on reversing the current. Mr. Grove concluded that the electrolysis was effected by induction across the thin glass of the Florence flask, and that its cessation indicated something like a state of charge or polarization of the surface of the glass.

'On the Composition of Jet,' by Prof. ROWNEY.

'On a New Form of Blowpipe for Laboratory Use,' by Dr. HERMANN SPRENGEL.

'On the Occurrence of Poisonous Metals in Cheese,' by Prof. VOELCKER.—The author stated that he had detected both copper and zinc in cheese. In some specimens copper, in others zinc, and in some both copper and zinc, were found. The description of cheese in which these poisonous metals were found was double-Gloucester cheese. Skimmed-milk cheese, which was likewise examined for copper and zinc, did not contain any metallic impurity. Stilton, and other varieties of cheese, have not as yet been examined; it must not therefore be inferred that cheese made in other districts than Gloucestershire contains poisonous metals. Inquiry in the dairy districts of Gloucestershire and Wiltshire has led to the discovery that in many dairies in these counties sulphate of copper, and sometimes sulphate of zinc, are employed in the making of cheese. The reasons for which these prejudicial salts are added to the cheese are variously stated. Some persons added sulphate of zinc with a view of giving new cheese the taste of old—others employed sulphate of copper for the purpose of preventing the *heaving* of cheese. Dr. Voelcker also stated that he had found alum in Gloucester cheese, and mentioned that he had learnt that in some dairies alum was employed to effect a more complete separation of the caseine from the whey.

'On Waterproof and Unalterable Small-arm Cartridges,' by T. SCOFFERN.

'On the Isomers of Cumole,' by W. DE LA RUE and Dr. HUGO MÜLLER.

'On a new Acetic Ether occurring in a Natural Resin,' by W. DE LA RUE and Dr. HUGO MÜLLER.

'On the Atomic Weight of Oxygen,' by Dr. W. A. MILLER.

SECTION C.—GEOLOGY.

President—Rev. A. SEDGWICK.

Vice-Presidents—Sir CHARLES LYELL, L. HORNER, Major-Gen. PORTLOCK.

Secretaries—Prof. HARKNESS, Capt. WOODALL, E. HULL.

Committee—Rev. Dr. Anderson, R. Godwen Austen, S. H. Beckles, E. W. Binney, Rev. P. B. Brodie, Dr. Bizsby, Dr. Bowerbank, R. Chambers, the Earl of Ducie, Rev. C. Erle, the Earl of Enniskillen, A. Favre, Dr. Falconer, Sir R. Griffith, A. Gages, Prof. Hochstetter, W. J. Hamilton, Prof. Huxley, Sir H. James, Sir J. V. B. Johnstone, T. Rupert Jones, J. B. Jukes, G. H. Kinahan, Rev. W. Lister, Sir R. I. Murchison, J. C. Moore, Prof. Morris, C. Moore, R. W. Mylne, Prof. Owen, W. Pengelly, J. Prestwich, J. W. Salter, Rev. W. S. Symonds, W. Sanders, Lord Talbot de Malahide, J. Tennant, W. Whitaker, Rev. H. H. Wood, E. Wood, Rev. Dr. Whewell, Dr. Wright.

THURSDAY.

Opening Address by the PRESIDENT.

'On the Geology of the Vicinity of Oxford,' by Prof. PHILLIPS.

'On the Invertebrate Fauna of the Lower Oolites of Oxfordshire,' by J. F. WHITEAVES.

'On the Blenheim Iron Ore, and the Thickness of the Formations below the Great Oolite at Stonesfield,' by E. HULL.

'On the Stratigraphical Position of certain Species of Coral in the Lias,' by the Rev. P. B. BRODIE.

'On the Geological Characters of the Sahara,' by the Rev. H. B. TRISTRAM.

'On the Mode of Flight of the Pterodactyles of the Coprolite Bed near Cambridge,' by the Rev. J. B. P. DENNIS.

FRIDAY.

'Remarks on the Elevation Theory of Volcanos,' by Dr. DAUBENY.

'Notes on some Points in Chemical Geology,' by T. STERRY HUNT.

'On the Geographical and Chronological Distribution of Devonian Fossils in Devon and Cornwall,' by W. PENGELLY.

'On the *Avicula Contorta* Bed, and Lower Lias in the South of England,' by Dr. WRIGHT.

'On some New Facts in Relation to the Section of the Cliff at Mundsley, Norfolk,' by JOSEPH PRESTWICH.

SECTION D.—ZOOLOGY AND BOTANY, INCLUDING PHYSIOLOGY.

President—Rev. Prof. HENSLOW.

Vice-Presidents—Dr. DAUBENY, Sir W. JARDINE, Prof. OWEN.

Secretaries—Dr. LANKESTER, E. PERCEVAL WRIGHT, P. L. SCLATER, W. S. CHURCH.

Committee—Dr. Andrews, G. Busk, C. C. Babington, I. Byerley, Dr. Bennett, J. Blackwall, Dr. Bowerbank, P. P. Carpenter, C. Collingwood, Prof. Carus, J. Clarke, Prof. Draper, Prof. Greene, Rev. A. R. Hogan, Prof. Huxley, Dr. G. Hartlaub, Rev. H. H. Higgins, Dr. J. D. Hooker, Rev. T. Hincks, J. Gwyn Jeffreys, J. Lubbock, R. MacAndrew, A. Newton, Prof. Ogilvie, Lovell Reeve, H. T. Stainton, A. F. Sealy, Rev. H. B. Tristram, Prof. Van der Hoeven, Prof. Verloren, J. O. Westwood.

THURSDAY.

In this Section no address was given at the commencement of the meetings. Prof. HENSLOW, in taking the chair, stated that he had been appointed President, as Dr. Daubeny had found it impossible to take this position, and perform efficiently his duties as Vice-President of the Association.

Dr. OGILVIE commenced the proceedings of the Section by bringing up the Report of the Dredging Committee, appointed for the North and East Coasts of Scotland. It appeared that, on account of the tempestuous state of the weather and the early meeting of the Association, little work had been done.

'On the Progress of Natural Science in the United States and Canada,' by the Rev. P. P. CARPENTER.—The principal part of this communication was devoted to an explanation of the principles and working of the Smithsonian Institution, at Washington, D.C. It was founded "for the increase and diffusion of knowledge among men," and was not restricted either by nature or "red tape." It gives aid to those prosecuting any branch of research; carries on an extensive series of meteorological observations over the North American Continent; directs the Natural History observations of the various governmental exploring expeditions; superintends an intricate system of exchanges of books and specimens between individuals or Societies in Europe or America, in conjunction with the Royal Society, and with special exemption from customs; and gives to the world a large amount of original matter through the press. The entire Museum department of the United States Government, till lately deposited at the Patent Office, is now the property of the Smithsonian Institution, with authority to exchange duplicates. The publications consisted of three classes—(1) the "Smithsonian Contributions to Knowledge," expensive works sold at cost price; (2) the "Miscellaneous Collections" of pamphlets, which are freely distributed; and (3) an annual volume of Reports, &c. published at Government expense. In regulating exchanges, whether of books or specimens, the directors did not require a *quid pro quo*, but simply a friendly reciprocity; their first desire being to make their materials *useful to science*, wherever that could best be done.* The Federal Government, as well as most of the Sovereign States, had published Reports on Geology and other branches of science, many of which were of the highest value. The ten quarto volumes on the 'Pacific Railroad,' abounding in plates, contains a complete *résumé* of the Natural History of the great western deserts and the Rocky Mountains, and may be purchased in Washington for about 5*l*. The State of Massachusetts is giving liberal aid to Prof. Agassiz in forming a magnificent museum at Cambridge University, which will be arranged geographically. There is already a vast amount of material accessible to students, and of duplicates for exchanges. The State Museum at Albany is under the direction of the Regents of the University of New York. They have a large number of duplicate palæozoic fossils, available for exchange. The Academy of Natural Science of Philadelphia, the Lyceum of New York, and the Natural History Society of Boston, are well known by their publications. The Colleges of Yale, Amherst, and Charleston, S.C., have also done good service to science. In Canada, the Geological Survey under Sir W. Logan is not surpassed by any for admirable arrangement. The Natural History Societies both of Montreal and of Toronto publish periodicals. In M'Gill College, Montreal, under Prof. Dawson, and in the University of Toronto, under Prof. Hincks, the study of natural science is steadily increasing. The importance of the magnetic observations at Toronto is well known; and a system of recording meteorological information, at the public grammar-schools of Canada West, is now being organized in connexion with the Smithsonian Institution.

Mr. P. L. SCLATER stated that he could confirm all the author had said with regard to the very complete museums of the United States. He could also confirm all that he had said with regard to the courteous manner in which all the specimens were placed at the disposal of the scientific student.

'On the Final Causes of the Sexuality of Plants, with particular Reference to Mr. Darwin's Work "On the Origin of Species by Natural Selection,"' by Dr. DAUBENY.—Dr. Daubeny began by pointing out the identity between the two modes by which the multiplication of plants is brought about, the very same properties being imparted to the bud or to the graft as to the seed produced by the ordinary process of fecundation, and a new individual being in either instance equally produced. We are, therefore, led to speculate as to the final cause of the existence of sexual organs in plants, as well as in those lower animals which can be propagated by cuttings. One use, no doubt, may be the dissemination of the species; for many plants, if propagated by buds alone, would be in a manner confined to a single spot. Another secondary use is the production of fruits which afford nourishment to animals. A third may be to minister to the gratification of the senses of man by the beauty of their forms and colours. But as these ends are only answered in a small proportion of cases, we must seek further for the uses of the organs in question; and hence the author suggested that they might have been provided, in order to prevent that uniformity in the aspect of Nature, which would have prevailed if plants had been multiplied exclusively by buds. It is well known that a bud is a mere counterpart of the stock from whence it springs, so that we are always sure of obtaining the very same description of fruit by merely grafting a bud or cutting of a pear or apple tree upon another plant of the same species. On the other hand, the seed

* All communications to the Smithsonian Institution should be addressed to "Prof. Henry, Secretary of the S. I., Washington, D.C., U.S.A."

never produces an individual exactly like the plant from which it sprang; and hence, by the union of the sexes in plants, some variation from the primitive type is sure to result. Dr. Daubeny remarked that if we adopt in any degree the views of Mr. Darwin with respect to the origin of species by natural selection, the creation of sexual organs in plants might be regarded as intended to promote this specific object. Whilst, however, he gave his assent to the Darwinian hypothesis, as likely to aid us in reducing the number of existing species, he wished not to be considered as advocating it to the extent to which the author seems disposed to carry it. He rather desired to recommend to naturalists the necessity of further inquiries, in order to fix the limits within which the doctrine proposed by Mr. Darwin may assist us in distinguishing varieties from species.

Prof. HUXLEY, having been called on by the Chairman, deprecated any discussion on the general question of the truth of Mr. Darwin's theory. He felt that a general audience, in which sentiment would unduly interfere with intellect, was not the public before which such a discussion should be carried on. Dr. Daubeny had brought forth nothing new to demand or require remark.—Mr. R. DOWDEN, of Cork, mentioned, first, two instances in which plants had been disseminated by seeds, which could not be effected by buds; first, in the introduction of *Senecio squalida*, by the late Rev. W. Hincks; and, second, in the diffusion of chicory, in the vicinity of Cork, by the agency of its winged seeds. He related several anecdotes of a monkey, to show that however highly organized the Quadrumana might be, they were very inferior in intellectual qualities to the dog, the elephant and other animals. He particularly referred to his monkey being fond of playing with a hammer; but although he liked oysters as food, he never could teach him to break the oysters with his hammer as a means of indulging his appetite.—Dr. WRIGHT stated that a friend of his, who had gone out to report on the habits of the gorilla—the highest form of monkey—had observed that the female gorilla took its young to the sea-shore for the purpose of feeding them on oysters, which they broke with great facility.—Prof. OWEN wished to approach this subject in the spirit of the philosopher, and expressed his conviction that there were facts by which the public could come to some conclusion with regard to the probabilities of the truth of Mr. Darwin's theory. Whilst giving all praise to Mr. Darwin for the courage with which he had put forth his theory, he felt it must be tested by facts. As a contribution to the facts by which the theory must be tested, he would refer to the structure of the highest Quadrumana as compared with man. Taking the brain of the gorilla, it presented more differences, as compared with the brain of man, than it did when compared with the brains of the very lowest and most problematical form of the Quadrumana. The deficiencies in cerebral structure between the gorilla and man were immense. The posterior lobes of the cerebrum in man presented parts which were wholly absent in the gorilla. The same remarkable differences of structure were seen in other parts of the body; yet he would especially refer to the structure of the great toe in man, which was constructed to enable him to assume the upright position; whilst in the lower monkeys it was impossible, from the structure of their feet, that they should do so. He concluded by urging on the physiologist the necessity of experiment. The chemist, when in doubt, decided his questions by experiment; and this was what was needed by the physiologist. —Prof. HUXLEY begged to be permitted to reply to Prof. Owen. He denied altogether that the difference between the brain of the gorilla and man was so great as represented by Prof. Owen, and appealed to the published dissections of Tiedemann and others. From the study of the structure of the brain of the Quadrumana, he maintained that the difference between man and the highest monkey was not so great as between the highest and the lowest monkey. He maintained also, with regard to the limbs, that there was more difference between the toeless monkeys and the gorilla than between the latter and man. He believed that the great feature which distinguished man from the monkey was the gift of speech.

Prof. GREENE, of Cork, read his 'Report on the Present State of our Knowledge of the Group Medusidæ.'

Dr. LANKESTER read a paper for Mr. HOGG, 'On a Fourth Kingdom of Nature.'—The author stated the great difficulty he had long experienced when examining some of the simpler living beings, in defining the characters of those primary forms of life, whether they belong to the vegetable or animal kingdom. And he considered that there may, strictly, be no distinction in nature between those kingdoms; and that life in the lowest animal, as well as in the simplest plant, may be the same; still that it is necessary to draw a line of demarcation between them, for the purpose of classifying the numerous creatures or organisms existing in the world. Mr. J. Hogg then showed that he had, more than twenty years ago, demonstrated that locomotion, although apparently spontaneous, was no distinction of animality. Neither could the presence of iodine nor of starch be accounted a satisfactory test of vegetability. So the four chemical elements, hydrogen, carbon, nitrogen, and oxygen, have been regarded for the same objects, though without positive success. And even the green colouring matter, called "chromule," or "chlorophyll," once supposed to belong exclusively to vegetables, has been shown to be likewise present in certain of the lower animals. But the author observed that the "two principal characteristics of an animal are undoubtedly the muscular and nervous systems, which do not exist in a plant, and which Prof. Owen has not included in his definitions of a plant and an animal given in his new work on 'Palæontology.'" Mr. J. Hogg then referred to Linnæus's arrangement of all natural bodies into three kingdoms; and, after quoting his definitions of Lapides, Vegetabilia, and Animalia, said, that they must at this day be accounted as insufficient and too concise. And, considering the great extension of science, both in Zoology and Botany, which had taken place since the time of Linnæus, he attempted to enlarge the definitions of those three divisions of natural bodies, thus:—Minerals are bodies, hard, aggregative, simple or component, having bulk, weight, and often regular form; but inorganic, inanimate, indestructible by death, insentient, and illocomotive. Vegetables are beings, organic, living, nourishable, stomachless, generative, destructible by death, possessing some sensibility; sometimes motive, and sometimes locomotive in their young or seed state; but inanimate, insentient, immuscular, nerveless, and mostly fixed by their roots. Animals are beings, organic, living, nourishable, having a stomach, generative, destructible by death, motive, animate, sentient, muscular, nervous, and mostly spontaneously locomotive, but sometimes fixed by their bases. Further, as regards a fourth kingdom of Nature, the author having perused Prof. Owen's 'Palæontology,' published this year, found that he had introduced the "Kingdom Protozoa," and placed it before the "Kingdom Animalia." He proved that there were objections to the term "Protozoa," which was formed by a foreign naturalist; and that it could not include those lower organisms, whose nature partook more of plants (phyta) than of animals (zoa) without creating errors. And since it appears to many desirable to place those organic beings which are of a doubtful nature in a fourth or an additional kingdom, he suggested one under the title of the Primigenal Kingdom,—Regnum Primigenum continens Protoctista, *i. e.*, Protophyta et Protozoa. This would comprise all the lower creatures, or the primary organic beings—"Protoctista," from πρῶτος, *first*, and κτιστὰ, *created beings*—both Protophyta and Protozoa; and would also include the Sponges or Amorphozoa of M. de Blainville, although Mr. J. Hogg thought it better to substitute for the former the name of Amorphoctista, derived from ἄμορφος, *formless*, and κτιστὰ, *creatures*, or organisms. Some having compared the Vegetable and Animal Kingdoms to *two* pyramids, which diverge from each other as they ascend, but are placed on a common base, the author conceived that that *base* might fairly represent the Primigenal Kingdom, which embraces the lower or primary organisms of both the former, but which are of a doubtful nature, and can in some instances only be considered as having become blended or mingled together.

An accompanying diagram was exhibited, which represented the two pyramids springing from the same base; one, coloured yellow, denoted the Vegetable Kingdom; the other was tinged blue, and signified the Animal Kingdom; whilst the base, common to both, was coloured green, which was intended to show by the union of the two former colours the blending of the two natures of the lower created beings comprised in the fourth, or Primigenal Kingdom. These pyramids, with their base, stood on a foundation tinged brown, thereby signifying the earth and the Mineral Kingdom.

Dr. LANKESTER could not agree with the author as to the necessity of a fourth kingdom in nature.

Mr. WESTWOOD read a paper, 'On a Lepidopterous Parasite occurring on the Body of the *Fulgora candelaria*.'—After some general remarks on parasitism, the author gave a detailed account of the occurrence of the larvæ of a species of moth on the body of the firefly (*Fulgora candelaria*). He proposed to call the moth *Epipyrops anomala*.

Mr. STAINTON said this was the only instance he knew of the larvæ of the Lepidoptera being parasitical.—The Rev. Mr. HIGGINS stated that the larvæ of a species of beetle were subject to the attacks of *Sphæria militaris*, of which he generally obtained fifteen or sixteen specimens every autumn.

FRIDAY.

'Report on Experiments in the Growth of Plants,' by Prof. BUCKMAN.—The author reported that he had about 200 plots of ground occupied with various experimental crops, a full account of which must be delayed, from the backwardness of the season on the one hand, and the early period of meeting of the Association on the other. In this case only a few of the subjects of experiment were explained by the author, from which we select the following:—*Poa (glyceria) aquatica* had been the subject of fresh experiments, and two specimens were shown to the Section, one from the garden of the Royal Agricultural College, and another from the Messrs. Sutton, of Reading; these were identical in all their details, but the point of interest consists in the great amount of difference between the induced forms and the *Poa aquatica*, whose seeds had been used. The new specimens, indeed, had the external aspect of large examples of *Poa trivialis*, but still with very different botanical details from that species, and is, in fact, held by the author to be as distinct from *Poa aquatica* as from any other species of Poa whatever; still it is really a Poa, so that the name Glyceria, as applied to it, is inadmissible. The *Cardnus arvensis* had been the subject of experiment, and its growth from seeds was traced, and its method of increase by rhizomata explained by means of drawings of growth at different periods. The interest of this subject consisted in the fact, that it had been denied that this plant was developed from seed at all, but the author showed that one stem of the plant may produce as many as twenty heads, each having 170 seeds; thus, $170 \times 20 = 3{,}400$ seeds, which may be produced by a moiety of this thistle: so that it becomes important that roadsides and waste places should be looked to, to prevent the flowering and seeding of what may become a most pernicious pest, spreading from a seeding centre to incredible distances all around.

Col. MUNROE, after having examined the specimens produced, expressed his surprise that the two grasses exhibited by Mr. Buckman should have been produced from the same seeds. He regarded one as the *Glyceria fluitans*, and the other as a form of *Poa trivialis*, or, perhaps, *P. pratensis*.—Mr. C. C. BABINGTON felt sure, from the great difference between the two forms of grasses exhibited, that some error had crept in during the experiment.

'On some Specimens of Shells from the Liverpool Museum, originally from the Pathological Collection formed by the late Mr. Gaskoin,' by the Rev. H. H. HIGGINS, Rainhill, Liverpool.—The late Mr. Gaskoin had in his museum a series of specimens, collected for the purpose of illustrating

had disappeared, so that, in this tiny specimen, there were ninety teeth! Of the order Reptilia there were probably eight or nine genera, consisting of detached teeth, scutes, vertebræ, and ribs, and articulated bones. Amongst these he had found the flat crushing teeth of the Placodus: a discovery of interest, for hitherto this reptile had only been found in the muschelkalk of Germany,—a zone of rocks hitherto wanting in this country, but which, in its Fauna, was represented by the above reptile. But by far the most important remains in the deposit were indications of the existence of triassic mammalia. Two little teeth of the Microlestes had, some years before, been found in Germany, and were the only traces of this high order in beds older than the Stonesfield slate. The author's minute researches had brought to light fifteen molar teeth, either identical with, or allied to, the Microlestes, and also five incisor teeth, evidently belonging to more than one species. A very small double-fanged tooth, not unlike the oolitic Spalacotherium, proved the presence of another genus and a fragment of a tooth, consisting of a single fang, with a small portion of the crown attached, a third genus, larger in size than the Microlestes. Three vertebræ, belonging to an animal smaller than any existing mammal, had also been found. The author inferred that, if twenty-five teeth and vertebræ, belonging to three or four genera of Mammalia, were to be found within the space occupied by three square yards of earth, that portion of the globe which was then dry land, and from whence the material was in part derived, was probably inhabited at this early period of its history by many genera of Mammalia, and would serve to encourage a hope that this family might yet be found in beds of even a more remote age.

A discussion followed, in which Sir C. LYELL, Prof. SEDGWICK, Dr. H. FALCONER, and others took part, when the importance of the author's discoveries was recognized.

'On the Osseous Caves of Tenby,' by the Rev. G. N. SMITH.

MONDAY.

'On the Igneous Rocks interstratified with the Carboniferous Limestone of the Basin of Limerick,' by Prof. JUKES.

'On the Stratigraphical Position of certain Species of Corals in the Lias,' by the Rev. P. B. BRODIE.

'On some Reptilian Foot-prints from the New Red Sandstone North of Wolverhampton,' by the Rev. W. LISTER.

'On the Effects of long-continued Heat—shown in the Iron Furnaces of the West of Yorkshire,' by the Rev. W. V. HARCOURT.

'On some Phenomena of Metamorphism in Coal in the United States,' by Prof. ROGERS.

TUESDAY.

'On the Geology of the Vicinity of the Neighbourhood of Cambridge, and the Fossils of the Upper Green Sand,' by Prof. SEDGWICK.

'Some Observations upon the Geological Features of the Volcanic Island of St. Paul, in the South Indian Ocean, illustrated by a Model in Relief of the Island, made by Capt. Cybulz, of the Austrian Artillery,' by Prof. F. von HOCHSTETTER.

'Remarks on the Geology of New Zealand, illustrated by Geological Maps, Drawings, and Photographs,' by Prof. F. von HOCHSTETTER.

'On some Transformations of Iron Pyrites in connexion with Fossil Remains,' by A. GAGES.

'Remarks on Fossil Fish from the North Staffordshire Coal-Fields,' by W. MOLYNEUX.

'On the Old Red Sandstone and its Fossil Fish in Forfarshire, with an Account of the Fish by Sir P. Egerton,' communicated by Sir R. I. Murchison, by W. POWRIE.

'On a New Form of Ichthyolite discovered by Mr. Peach,' by Sir P. EGERTON.

'On Two Newly-discovered Caves in Sicily containing Worked Flints,' by Baron F. ANCA.

'On the Six-inch Maps of the Geological Survey,' by E. HULL.

'On the Selection of a Peculiar Geological Habitat by some of the rarer British Plants,' by the Rev. W. SYMONDS.

'On the Koh-i-Noor previous to its Cutting,' by the Rev. W. MITCHELL and Prof. TENNANT.

'On a Recent Volcanic Eruption in Iceland,' by Dr. W. S. LINDSAY.

'Details respecting a Nail found in Kingoodie Quarry,' by Sir D. BREWSTER.

'On the Tynedale Coalfield and Whinsil,' by J. A. KNIPE.

'On Slikensides,' by J. PRICE.

'Notes on the Geology of Capt. Palliser's Route across the Rocky Mountains,' by Dr. HECTOR.

SECTION D.—ZOOLOGY AND BOTANY, INCLUDING PHYSIOLOGY.

SATURDAY.

A report from Dr. Kinahan, 'On the Results of Dredging in Dublin Bay,' was communicated to the Section through Mr. M'ANDREW.

Mr. WESTWOOD gave an account of an insect which, on account of its anomalous character, had been referred to three different groups of the order Insecta.

Dr. DAUBENY invited the Members to visit an experimental garden under his superintendence in the neighbourhood of Oxford.

Mr. R. M'ANDREW read a Report from the General Dredging Committee, and laid on the table a set of blank forms which had been printed by the Committee for the purpose of being filled up by those who were engaged in dredging.

Dr. LANKESTER called attention to the completion of the first part of Mr. Blackwall's work on British Spiders,—a copy of which he placed on the table. The work contains twelve coloured plates, and is one of the most complete monographs hitherto published of the class of animals to which it is devoted. It forms the Ray Society's volume for 1859.

Dr. COLLINGWOOD read a paper 'On Recurrent Animal Form, and its Significance in Systematic Zoology.'—The object of this paper was to call attention to the frequent recurrence of similar forms in widely-separated groups of the animal kingdom; similarities, therefore, which were unaccompanied by homologies of internal structure. These analogies of form had greatly influenced the progress of classification, by attracting the attention of systematizers while as yet structural homologies were imperfectly understood; and, as a consequence, many groups of animals had been temporarily located in a false position, such as bats and whales by the ancients, and the Polyzoa and Foraminifera in more modern times. These resemblances in form were illustrated generally by the classes of Vertebrata, and more especially by the various orders of Mammalia,—the Invertebrata affording, however, many remarkable examples. Since no principle of gradation of form would sufficiently account for these analogies, the author had endeavoured to discover some other explanation, and had come to the conclusion, that the fact of deviations from typical *form* being accompanied by modifications of typical *habits*, afforded the desired clue. Examples of this were given, and the principle educed, that *agreement of habit and economy in widely-separated groups is accompanied by similarity of form.* This position was argued through simple cases to the more complex, and the conclusion arrived at that, where habits were *known*, the explanation sufficed; and it was only in the case of animals of low organization and obscure or unknown habits, that any serious difficulty arose in its application; so that our appreciation of the *rationale* of their similarity of form was in direct ratio to our knowledge of their habits and modes of life. In conclusion, by a comparison of the Polyzoa with the Polyps, it was shown that the economy of both was nearly identical, although they possessed scarcely anything in common except superficial characters; and this identity of habit was regarded as the explanation of their remarkable similarity of form.

'On the Intellectual Development of Europe, considered with Reference to the Views of Mr. Darwin and others, that the Progression of Organisms is determined by Law,' by Prof. DRAPER, M.D., of New York.—The object of this paper was to show that the advancement of man in civilization does not occur accidentally or in a fortuitous manner, but is determined by immutable law. The author introduced his subject by recalling proofs of the dominion of law in the three great lines of the manifestation of life. First, in the successive stages of development of every individual, from the earliest rudiment to maturity; secondly, in the numberless organic forms now living contemporaneously with us, and constituting the animal series; thirdly, in the orderly appearance of that grand succession which in the slow lapse of geological time has emerged, constituting the life of the Earth, showing therefrom not only the evidences, but also proofs of the dominion of law over the world of life. In those three lines of life he established that the general principle is, to differentiate instinct from automatism, and then to differentiate intelligence from instinct. In man himself three distinct instrumental nervous mechanisms exist, and three distinct modes of life are perceptible, the automatic, the instinctive, the intelligent. They occur in an epochal order, from infancy through childhood to the more perfect state. Such holding good for the individual, it was then affirmed that it is physiologically impossible to separate the individual from the race, and that what holds good for the one holds good for the other too; and hence that man is the archetype of society, and individual development the model of social progress, and that both are under the control of immutable law: that a parallel exists between individual and national life in this, that the production, life, and death of an organic particle in the person, answers to the production, life, and death of a person in the nation. Turning from these purely physiological considerations to historical proof, and selecting the only European nation which thus far has offered a complete and completed intellectual life, Prof. Draper showed, that the characteristics of Greek mental development answer perfectly to those of individual life, presenting philosophically five well-marked ages or periods,—the first being closed by the opening of Egypt to the Ionians; the second, including the Ionian, Pythagorean, and Eleatic philosophies, was ended by the criticisms of the Sophists; the third, embracing the Socratic and Platonic philosophies, was ended by the doubts of the Sceptics; the fourth, ushered in by the Macedonian expedition and adorned by the splendid achievements of the Alexandrian school, degenerated into Neoplatonism and imbecility in the fifth, to which the hand of Rome put an end. From the solutions of the four great problems of Greek philosophy, given in each of these five stages of its life, he showed that it is possible to determine the law of the variation of Greek opinion, and to establish its analogy with that of the variations of opinion in individual life. Next, passing to the consideration of Europe in the aggregate, Prof. Draper showed that it has already in part repeated these phases in its intellectual life. Its first period closes with the spread of the power of Republican Rome, the second with the foundation of Constantinople, the third with the Turkish invasion of Europe: we are living in the fourth. Detailed proofs of the correspondence of these periods to those of Greek life, and through them to those of individual life, are given in a work now printing on this subject, by the author, in America. Having established this conclusion, Prof. Draper next briefly alluded to many collateral problems or inquiries. He showed that the advances of men are due to external and not to interior influences, and that in this respect a nation is like a seed, which can only develope when the conditions are favourable, and then only in a definite way; that the time for psychical change corresponds with that for physical, and that a nation cannot advance except its material condition be touched,—this having been the case throughout all Europe, as is manifested by the diminution of the blue-eyed races thereof; that all organisms and even man are dependent for their characteristics, continuance, and life on the physical conditions under which they live; that the existing apparent invariability presented by the world of organization is the direct consequence of the physical equilibrium, but that if that should suffer modification, in an instant the fanciful doctrine of the immutability of species would be brought to its proper value. The organic

world appears to be in repose because natural influences have reached an equilibrium. A marble may remain motionless for ever on a level table, but let the table be a little inclined, and the marble will quickly run off; and so it is with organisms in the world. From his work on Physiology, published in 1856, he gave his views in support of the doctrine of the transmutation of species; the transitional forms of the animal and also the human type; the production of new ethnical elements, or nations; and the laws of their origin, duration, and death.

The announcement of this paper attracted an immense audience to the Section, which met this morning in the Library of the New Museum. The discussion was commenced by the Rev. Mr. CRESSWELL, who denied that any parallel could be drawn between the intellectual progress of man and the physical development of the lower animals. So far from the author being correct with regard to the history of Greece, its masterpieces in literature —the Iliad and Odyssey—were produced during its national infancy. The theory of intellectual development proposed was directly opposed to the known facts of the history of man.—Sir B. BRODIE stated, he could not subscribe to the hypothesis of Mr. Darwin. His primordial germ had not been demonstrated to have existed. Man had a power of self-consciousness—a principle differing from anything found in the material world, and he did not see how this could originate in lower organisms. This power of man was identical with the Divine Intelligence; and to suppose that this could originate with matter, involved the absurdity of supposing the source of Divine power dependent on the arrangement of matter.—The BISHOP OF OXFORD stated that the Darwinian theory, when tried by the principles of inductive science, broke down. The facts brought forward did not warrant the theory. The permanence of specific forms was a fact confirmed by all observation. The remains of animals, plants, and man found in those earliest records of the human race—the Egyptian catacombs, all spoke of their identity with existing forms, and of the irresistible tendency of organized beings to assume an unalterable character. The line between man and the lower animals was distinct: there was no tendency on the part of the lower animals to become the self-conscious intelligent being, man; or in man to degenerate and lose the high characteristics of his mind and intelligence. All experiments had failed to show any tendency in one animal to assume the form of the other. In the great case of the pigeons quoted by Mr. Darwin, he admitted that no sooner were these animals set free than they returned to their primitive type. Everywhere sterility attended hybridism, as was seen in the closely-allied forms of the horse and the ass. Mr. Darwin's conclusions were an hypothesis, raised most unphilosophically to the dignity of a causal theory. He was glad to know that the greatest names in science were opposed to this theory, which he believed to be opposed to the interests of science and humanity.—Prof. HUXLEY defended Mr. Darwin's theory from the charge of its being merely an hypothesis. He said, it was an explanation of phenomena in Natural History, as the undulating theory was of the phenomena of light. No one objected to that theory because an undulation of light had never been arrested and measured. Darwin's theory was an explanation of facts; and his book was full of new facts, all bearing on his theory. Without asserting that every part of the theory had been confirmed, he maintained that it was the best explanation of the origin of species which had yet been offered. With regard to the psychological distinction between man and animals; man himself was once a monad—a mere atom, and nobody could say at what moment in the history of his development he became consciously intelligent. The question was not so much one of a transmutation or transition of species, as of the production of forms which became permanent. Thus the short-legged sheep of America were not produced gradually, but originated in the birth of an original parent of the whole stock, which had been kept up by a rigid system of artificial selection.—Admiral FITZROY regretted the publication of Mr. Darwin's book, and denied Prof. Huxley's statement, that it was a logical arrangement of facts.—Dr. BEALE pointed out some of the difficulties with which the Darwinian theory had to deal, more especially those vital tendencies of allied species which seemed independent of all external agents.—Mr. LUBBOCK expressed his willingness to accept the Darwinian hypothesis in the absence of any better. He would, however, express his conviction, that time was not an essential element in these changes. Time alone produced no change. —Dr. HOOKER, being called upon by the President to state his views of the botanical aspect of the question, observed, that the Bishop of Oxford having asserted that all men of science were hostile to Mr. Darwin's hypothesis,—whereas he himself was favourable to it,—he could not presume to address the audience as a scientific authority. As, however, he had been asked for his opinion, he would briefly give it. In the first place, his Lordship, in his eloquent address, had, as it appeared to him, completely misunderstood Mr. Darwin's hypothesis: his Lordship intimated that this maintained the doctrine of the transmutation of existing species one into another, and had confounded this with that of the successive development of species by variation and natural selection. The first of these doctrines was so wholly opposed to the facts, reasonings, and results of Mr. Darwin's work, that he could not conceive how any one who had read it could make such a mistake,—the whole book, indeed, being a protest against that doctrine. Then, again, with regard to the general phenomena of species, he understood his Lordship to affirm that these did not present characters that should lead careful and philosophical naturalists to favour Mr. Darwin's views. To this assertion Dr. Hooker's experience of the Vegetable Kingdom was diametrically opposed. He considered that at least one half of the known kinds of plants were disposable in groups, of which the species were connected by varying characters common to all in that group, and sensibly differing in some individuals only of each species; so much so that, if each group be likened to a cobweb, and one species be supposed to stand in the centre of that web, its varying characters might be compared to the radiating and concentric threads, when the other species would be represented by the points of union of these; in short, that the general characteristics of orders, genera, and species amongst plants differed in degrees only from those of varieties, and afforded the strongest countenance to Mr. Darwin's hypothesis. As regarded his own acceptation of Mr. Darwin's views, he expressly disavowed having adopted them as a creed. He knew no creeds in scientific matters. He had early begun the study of natural science under the idea that species were original creations; and it should be steadily kept in view that this was merely another hypothesis, which in the abstract was neither more nor less entitled to acceptance than Mr. Darwin's: neither was, in the present state of science, capable of demonstration, and each must be tested by its power of explaining the mutual dependence of the phenomena of life. For many years he had held to the old hypothesis, having no better established one to adopt, though the progress of botany had, in the interim, developed no new facts that favoured it, but a host of most suggestive objections to it. On the other hand, having fifteen years ago been privately made acquainted with Mr. Darwin's views, he had during that period applied these to botanical investigations of all kinds in the most distant parts of the globe, as well as to the study of some of the largest and most different Floras at home. Now, then, that Mr. Darwin had published it, he had no hesitation in publicly adopting his hypothesis, as that which offers by far the most probable explanation of all the phenomena presented by the classification, distribution, structure, and development of plants in a state of nature and under cultivation; and he should, therefore, continue to use his hypothesis as the best weapon for future research, holding himself ready to lay it down should a better be forthcoming, or should the now abandoned doctrine of original creations regain all it had lost in his experience.

MONDAY.

'On the Woody Fibres of Flowering and Cryptogamic Plants,' by Dr. OGILVIE.

Dr. WRIGHT read a paper from Mr. Price, of Birkenhead, 'On the Genus Cydippe.'

Dr. DAUBENY gave an account of some experiments he had performed on the subject of Equivocal Generation. He described the apparatus he had employed, and stated that, after passing air through sulphuric acid, he found in the distilled water into which it was introduced, indications of organic life.—Dr. BOWERBANK pointed out two sources of error in the experiments: first, that the bottles used were corked, and, second, that they were covered with linseed-meal. — Dr. OGILVIE had performed a series of experiments of the same kind, but obtained no indications of life.

'On the Acclimatization of Animals, Birds, &c., in the United Kingdom,' by F. T. BUCKLAND.

Mr. WESTWOOD read a communication from Prof. Verloren, 'On the Effect of Temperature and Time on the Development of certain Lepidoptera.'—A table was exhibited showing the period at which the larvæ of the *Sphinx Ligustri* were hatched. From these tables it appeared that the great proportion of the insects were hatched in the middle of June.

Mr. H. T. STAINTON read a paper, 'On some Peculiar Forms amongst the Larvæ of the Micro-Lepidoptera.'

'On the *Aspergillum*, or Watering-pot Mollusc,' by LOVELL REEVE.

Prof. J. R. GREENE made some remarks on Embryology, with reference to the constitution of the sub-kingdoms of animals.

'On the Value of Development in Systematic Zoology and Animal Morphology,' by Prof. CARUS.—For the purpose of discussing the last two papers the Sub-section Physiology united with the Natural History Section, and Dr. ROLLESTON, Chairman of the Sub-section, took the chair.—Prof. CARUS expressed his conviction that the tendency of systematists at the present day was to overrate the importance of embryological conditions in relation to the classification of animals. He believed the homologies of organs could be made out without reference to their embryological distinctions.—Prof. HUXLEY maintained that the true homologies of organs, in a large number of cases, could not be made out without reference to their embryological conditions, and gave as an instance the fore extremities of the turtle.—A long discussion ensued, in which the CHAIRMAN, Mr. WESTWOOD, Dr. WRIGHT, Prof. GREENE, Mr. LUBBOCK, and Dr. OGILVIE took part.

TUESDAY.

D. C. COLLINGWOOD, of Liverpool, read a paper, 'On some New Forms of Nudibranchiate Mollusca, found in the River Mersey.'

Dr. DAUBENY stated that Dr. Bowerbank and other gentlemen had examined the jars in which he had performed his experiments on Equivocal Generation. No animal life was to be found, and only a few filaments of fungi. These were probably derived from the source of error pointed out by Dr. Bowerbank, in the cork and linseed-meal.

Mr. P. L. SCLATER read a paper, 'On the Geographical Distribution of Animals.'—The reading of this paper led to another discussion on the origin of species.—Mr. WESTWOOD exhibited a series of specimens of butterflies, showing the close relationship between the forms of Australia and South America.—Prof. HUXLEY stated that much stress had been laid upon the statement, that animals changed by domestication, returned to their primitive type when they were allowed to run wild. He did not think it was the case; and it was an assumption that the wild horses of the Pampas of America were identical in form with the original wild horse.—Mr. J. CLARKE stated that cultivated tulips had a tendency to run back into the common form of the wild tulip.—Dr. WRIGHT stated that he had tried experiments on the cultivated cabbage, and, although it degenerated, it never assumed the form of the genuine wild plant, *Brassica oleracea*.

Mr. T. M. MASTERS read a paper 'On the Morphology of some Monstrous Forms of Plants.'—The paper was illustrated by a large number of

recent and dried forms of monstrous plants and parts of plants.

'Notice of British Well Shrimps,' by the Rev. A. HOGAN.—The author exhibited specimens of some remarkable additions not long since made to our British Crustacea. They consisted of two species of Nephargus (Fontanus and Kochianus), and the new genus, Crangonyx, with its single species Subterraneus of Spence Bate. These species have been described and figured in the volume of the *Natural History Review and Quarterly Journal of Science* for last year (1859). They are of great interest, as examples of a subterranean Fauna in England, analogous to that long known on the Continent and in America. The first established instance of the occurrence of Niphargi in England was Mr. Westwood's discovery at Maidenhead, Berkshire, of a well containing numbers of *N. aquilæ*. They have, more recently, been obtained from Corsham and Warminster, Wiltshire, and also from Ringwood, on the borders of the New Forest, Hampshire. *Crangonyx subterraneus* has occurred at the two latter places, but not at the first named. *Niphargus fontanus* is found at both Corsham and Ringwood, but with a difference in the shape of the gnathopoda and posterior pleopoda, amounting to a probably distinct variety, if not species. The form of the gnathopoda, or hands, is worthy of attention, being each armed with a movable claw of large size, forming a prehensile organ of great power. *N. fontanus* is also possessed of small, yellow eyes, which distinguish it in a very marked way from the allied species (of the genus Gammarus) found on the Continent. Every member of the subterranean Fauna hitherto found has been destitute of eyesight. The movements of Niphargi, when kept in captivity, are interesting to observe; but Mr. Hogan states that he has found great difficulty in preserving them alive. The longest period during which even the strongest specimen survived its capture was three weeks. The average temperature of the water in which Niphargus and Crangonyx are found is about 50° Fahr., and they seem to propagate in recently-formed wells as freely as in old ones. In no case have any species of this family been found, either in this country or abroad, in open wells or other than artificial ones,—pumps, in fact. They are found at all seasons of the year, but most abundantly towards the end of the autumn. The largest size known among the English species (that of *N. fontanus*) hardly exceeds half an inch. Mr. Hogan hoped that more extended observations would be made in Great Britain on this interesting family of Crustacea, as their economy and structure are as yet very imperfectly known, and an accurate examination would be sure to reward the investigator with results at least as interesting as those already obtained regarding their allies by Continental naturalists.—Mr. WESTWOOD stated that it was curious to find this creature possessing the rudiments of eyes, for, in all other cases where creatures lived in the dark, they had no eyes at all.—Mr. M'ANDREW stated that he had described a species of Crustacea, dredged from a very great depth, that did not possess eyes.

The Rev. Prof. HENSLOW made some remarks on the growth of wheat obtained from mummies. He introduced his observations by reading a letter from Prof. Wartmann, of Geneva, who had recently found that seeds might be exposed to a temperature of 198° below zero of Fahrenheit's scale, without losing the power of germination. Prof. Henslow had himself exposed seeds to the temperature of boiling water, and they germinated. The question of how long seeds would retain their vitality was one of great interest; and a Committee of this Association had reported on the subject, but they had not succeeded in making seeds grow which had been kept more than two centuries. He then showed that all experiments recorded on the gowth of mummy wheat were fallacious, and especially noticed the case which had been relied on so much, of the growth of mummy wheat by the Rev. Mr. Tupper from seeds supplied him by Sir Gardner Wilkinson. The mummy wheat in this case was known to have been removed in jars that had been used for storing recent wheat. He then alluded to the raspberry seeds from the stomach of a warrior, found in the neighbourhood of Corfe Castle, and stated that the old seeds were actually exhibited at the Horticultural Society on the same table with recent ones, so that they might easily have been mixed.

A discussion ensued, in which numerous cases of the supposed antiquity of seeds were given, but no case which could be said to afford experimental proof.

Mr. WESTWOOD read a paper 'On Mummy Beetles.'

Dr. E. P. WRIGHT read the following notes 'On *Tomopteris onisciformis*.'—In the summer of 1858, while investigating with my friend Prof. J. Ray Greene, of Cork, the marine zoology of the south-west coast of Ireland, I had an opportunity of examining somewhat in detail the structure of that puzzling little annulose animal, called *Tomopteris onisciformis*. The tidal current sets in very strongly from the Atlantic into the narrow entrance between Bere Island and the main land, and carries along with it, in the summer season, whole fleets of oceanic swimming creatures. The number of naked-eyed Medusæ and free Actinozoans is almost past belief to those who have not witnessed similar phenomena. Various little bays with hollow caverns line the sides of this channel, and in these the water lies very still and quiet; here, too, vast numbers of the ocean swimmers congregate, imparting to the water almost a milky hue, which sometimes changes and presents an appearance as if oil had been cast upon it, owing to the highly prismatic colouring of the various Beroes, Æquoreas, Cydippes, &c. A retired nook of this sort is a very paradise to the marine explorer, and such were to us places of very frequent resort. After a little practice, one's eye got so accustomed to the varied kinds of locomotion that distinguished more or less each species, so that when I first perceived *T. onisciformis* swimming swiftly with its very peculiar wriggling movements, small as it was, I perceived it to be something new; and a few seconds served to transfer it to a glass collecting-jar. While the whole body was more or less employed, by successive wrigglings, in locomotion, yet it was quite obvious that true locomotion was effected by the bipinnated series of paddle-shaped organs which are attached at each side of the body. When compared with the graceful floating and umbrella movements of an Æquorea, or the headlong paddle-wheel-like movements of a Beroe or a Cydippe, it could not be truthfully described as graceful; nevertheless, there was something about it very characteristic—something that even seemed to point out its proper natural affinities. One of the little creatures lived in apparently good health with me for about twelve hours, though incarcerated in a small glass jar holding about ten ounces of water; and it would have probably lived longer, but I wanted its tail for examination, and the necessary compression of such an agile and slippery creature between two pieces of thin glass hastened its end. The author then alluded to the papers by Dr. Carpenter and others on this creature, and gave an outline of its anatomy, alluding to the presence of cilia on the pharyngeal portion, to the peculiar structure of the central portion of the antenna-like organs, to the tail-like extremity, and the presence thereon of masses of Spermatozoa, and finally expressed his conviction that there could be no doubt as to its being a complete creature, and that its tail is not a zooid form, as hinted by Dr. Carpenter.

SUB-SECTION D.—PHYSIOLOGY.

SATURDAY.

'On Saccharine Formation in the Breast,' by Dr. GIBB.

'On the Influence of Systematized Exercise on the Expansion of the Chest,' by Mr. MACLAREN.

'On the Structure of the Lepadidæ,' by R. GARNER.

MONDAY.

'On the Deglutition of Alimentary Fluids,' by Prof. CORBETT.

'An Experimental Inquiry into the Nature of Sleep,' by A. E. DURHAM.

'Some Remarks on the Anatomy of the Potto of Borneo (*Perodicticus Bennettii*),' by Prof. VAN DER HOEVEN.

'On Sugar and Amyloid Substance in the Animal Economy,' by Dr. R. M'DONNELL.

TUESDAY.

'Exhibition of Specimens Illustrating the Artificial Production of Bone and Osseous Grafts,' by M. OLLIER.

'Experiments on Muscular Action from an Electrical point of view,' by Dr. C. B. RADCLIFFE.

'On the Ultimate Arrangement of Nerves in Muscular Tissue,' by Prof. BEALE.

'On the Influence of Oxygen on Animal Bodies,' by Dr. B. W. RICHARDSON.

'On the Physiological Relations of the Colouring Matter of the Bile,' by Dr. THUDICHUM.

SECTION E.—GEOGRAPHY AND ETHNOLOGY.

SATURDAY.

'On the Geographical Distribution of Plants in Asia Minor,' by M. PIERRE DE TCHIHATCHEF.

'On the Aborigines of the Arctic and Sub-Arctic Regions of North America,' by Dr. RAE.

'On the Course and Results of the British North American Exploring Expedition, under his Command in the Years 1857-8-9,' by Capt. J. PALLISER.

'On the Tribes composing the Population of Morocco,' by Lieut. E. SCHLAGINTWEIT.

'On certain Remarkable Deviations in the Stature of Europeans,' by R. CULL.

MONDAY.

'On the Aryan or Indo-Germanic Theory of Races,' by J. CRAWFURD.

'On the Geography of the Proposed Communication between England and America *vid* the Faroës, Iceland, and Greenland,' by Col. SHAFFNER.

'On a Deep-Sea Pressure Gauge, invented by Henry Johnson,' by the Rev. Dr. BOOTH.

'On the Proposed Communication between the Atlantic and Pacific *vid* British North America,' by Capt. M. H. SYNGE, R.E.

'A New Map of the Interior of the Northern Island of New Zealand, constructed during an Inland Journey in 1859,' by Prof. F. VON HOCHSTETTER (Vienna), Geologist of the Austrian Novara Expedition.

'On Certain Ethnological Boulders, and their Probable Origin,' by the Rev. Dr. HINCKS.—The boulders in question were Indo-European words, which the author had discovered in Assyrian inscriptions, and by which he believed that he could trace the migration of the ancestors of the Hellenic, as distinguished from the Pelasgic, Greeks from the north of Europe, over the Caucasus, and across the Bosphorus; he believed that this migration was synchronous with that of the Persians, who came with them over the Caucasus, and separated from them afterwards. A branch of them passed into Syria, and were known to the Egyptians as Luthen or Lâthen; and the date of this migration is thus determined. It occurred under the eighteenth Egyptian dynasty. The first word, which occurred in the Inscriptions, which he pronounced to be obviously Indo-European, was ligwindinas, the name of an animal in the accusative plural. In the inscription on "the great slab or altar" found by Mr. Layard in the N.W. palace at Nimrûd, the king says that these animals "alive I took captive." This word Dr. Hincks supposed to correspond to the λεοντοειδεῖς of Classical Greek; but λέων was a secondary term for "lion";—the participle of a verb which was itself derived from the primary λῖς. We should thus have a more ancient form of the above word, λιοειδεῖς, or (as it would be written in the Cadmean alphabet) λεϝοϝειδίας; the ει having been probably substituted for εν, as a mode of lengthening the short vowel of the root, but the root being certainly ϝεδ. The word found in the Assyrian inscriptions would be written in the Cadmean alphabet λεγγενδεναϛ, ι being only used in this alphabet as a semi-vowel. The other word which Dr. Hincks believed to be Indo-European was Lâsanan, used as a genitive plural, but certainly not, as was once supposed, the genitive of the Semitic word for "tongue"; as this would be lisanâti. He believed this word to be the λᾶων of Classical Greek. The termination ῶν is, according