MISCELLANEOUS:—

E. Lartet and H. Christy. Reliquiæ Aquitanicæ. Part 5, 4to, 6 plates. Presented by the Executors of the late H. Christy.

Series of 34 Reports on the Forests, Timber-trees, and Forest Administration of India. Folio, 4to, and 8vo, 1856 to 1867. Presented by order of the Secretary of State for India in Council.

The following papers were read, viz.:—

1. "A brief account of the chief Enemies destructive of the Coffee-plant," by Surgeon John Shortt, M.D., F.L.S., &c.

2. "On the Silkworm-Oaks of Northern China," by Henry T. Hance, Ph.D. Communicated by J. D. Hooker, M.D., V.P.L.S., &c.

3. "On some new forms of Trichopterous Insects from New Zealand; with a List of the Species known to inhabit those Colonies," by Robert MacLachlan, Esq., F.L.S., Sec. Entomol. Soc.

4. "Notes on *Jussiæa*," by Mr. Charles Wright. Communicated by Dr. Hooker.

5. "Notulæ Capenses," by P. MacOwan, B.A. Communicated by Dr. Hooker.

6. "On the germination of *Orchis Morio*; with some remarks on the Embryos of the Cryptogams," by Benjamin Clark, Esq., F.L.S.

7. "Experiments in Pruning, with a view to the production of varieties, especially in *Zea Mays*; and remarks on certain analogies occurring in the Animal Kingdom, including notices of Diseases connected with the growth of Fungi," by the same.

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May 25, 1868.

*Anniversary Meeting.*

George Bentham, Esq., President, in the Chair.

This day (the Anniversary of the birth of Linnæus having fallen on a Sunday) being the day appointed by the Charter for the Election of Council and Officers, the President opened the business of the Meeting with the following Address:—

GENTLEMEN,

MY annual Report on the state and proceedings of our Society might be made almost in the same words, and with nearly the same satisfactory figures, as last year. Our publications have been equally extensive, entailing an expenditure of about £760; £82 have been applied to the purchase and binding of books, and £200 have been added to our invested capital, which now amounts to £1800. We are now subject to some temporary inconvenience from the darkening of our rooms by the new building of the Royal Academy; but I understand that all the difficulties which stood in the way of the proposed new wings and façade towards Piccadilly have been got over, and that the work will shortly be commenced. I trust, therefore, that our new appartments will be ready for us before we are obliged to vacate our present ones.

I propose in the following address to lay before you a sketch of the progress of biological science during the two years that have elapsed since my last review in my Address of 1866; and for this purpose I have again been enabled to avail myself of the kind assistance of Mr. W. S. Dallas, to whom I am indebted for the zoological information contained in the following pages. In a few occasional notes on the value of some of the various contributions made to our science, I have endeavoured to keep in mind the three great aims of the working naturalist:—1st, the accurate observation and delineation of facts, morphographic or biographic; 2nd, the coordination of these facts; and, 3rd, their generalization, this being the only course of proceeding which safely tends to a real advance in our knowledge of the phenomena of organic life. In the present state of science, the second process, the careful coordination of facts and observations, becomes daily more important. Individual species, subspecies, or varieties are described, individual observations are committed to print, in such endless variety and confusion, with repetitions so frequent, in publications so varied, that the general naturalist is little disposed to waste time in searching them out, until they are more or less collected, methodized, and compared with their nearest allies. Hence it is that Faunas or Floras, complete as to any special branch of either great class of beings, monographs of orders, tribes, or other large groups, connected treatises on special series of biological phenomena, even of very limited range, if carefully and comparatively worked out, are of infinitely greater value than long descriptions of new species, or of isolated experiments or observations in however

great a number they may be strung together, without arrangement or comparison. It has been very much the custom, for instance, for foreign botanic gardens to append to their catalogues so-called diagnoses of species of plants, which the director or curator had received under false names, or had been unable to determine, or which had become modified by cultivation, or which for any other reason have been supposed to be new. The consequence is that, from the times of Willdenow, Link, and Desfontaines to the latest lists of seeds or catalogues of German, Russian, or Italian Botanic Gardens, there has been no more fruitful source of the undeterminable puzzles which encumber our systematic works than these diagnoses which are not diagnostic. I shall not, therefore, detain you by any detailed enumeration of such works, or of detached descriptions of plants, insects, &c., brought from distant countries, and supposed to be new, because the describer could not or would not take the trouble of identifying them; nor shall I specially mention accounts, of botanical and entomological excursions, descriptions of, and dissertations on, critical species and hybrids, records of reappearances of rare animals and plants in particular districts, and similar notes; for although I fully admit the value of observations of detail, if accurate, as the groundwork of all that is valuable in the science, yet they require consolidation and comparison before they can contribute essentially to its advancement. Still less shall I attempt to dwell upon purely speculative works, such as proposals for new classifications, according to some special theory of the author, or perhaps founded upon some class of organs to which he has paid exclusive attention. In plants alone three or four such have been broached within the last two years, not one of them having the least chance of being adopted. My present object is, indeed, merely to give a general sketch, so far as my information extends, of the comparative activity of naturalists in the different countries where the study of Biology is prosecuted, commencing with Northern Europe and ending with our own country. For further details I have great satisfaction in referring in Zoology to the comprehensive Record of Zoological literature mentioned in my Address of 1866, and of which the volumes for 1865 and 1866 have since appeared, affording a fair promise that this most valuable repertory will be steadily continued. Unfortunately we have as yet nothing of the kind in Botany, the best Catalogue Raisonné of current botanical literature being perhaps the Revue Bibliographique of the Bulletin de la Société Botanique de France. That is, however, necessarily in a great measure

incomplete and unmethodical, containing chiefly detached sketches of the contents of the works sent to the Society, with occasional mention of such as may otherwise have been brought under the editor's notice.

## Denmark.

Professor Steenstrup, of Copenhagen, has published, in the Bulletin de la Société Ornithologique Suisse, a valuable dissertation on the Great Auk, entitled "Matériaux pour servir à l'histoire de l'*Alca impennis*," in which he has brought together all the accessible particulars as to the former distribution and history of this interesting bird, now believed to be extinct. It is followed by a supplementary note, by M. V. Fatio, on the extant specimens of the bird and its egg.

Professor Schiödte has published a paper, translated in the Annals and Magazine of Natural History, on the mode in which one of the eyes is transferred from one side of the head to the other in the young of *Pleuronectidæ*, confirming to a certain extent the views of Dr. Traquair, published in the 25th vol. of our Transactions. He has observed the eye, in the course of transfer, passing round the upper surface of the head, thus disposing of the opinions of those writers who have maintained that the eye passes as it were directly through the head; but at the same time he affirms that the eye passes always in front of the dorsal fin, and afterwards glides backward upon the surface so as eventually to lie behind the commencement of the dorsal. The same Professor's treatise on the sucking mouth of the Cymothoæ is an important contribution to the morphology of the mouth of Crustacea. Messieurs Bergsöe and Meinert have drawn up a joint monograph of Danish Geophilidæ; Professor Meinert alone has given an excellent memoir on the Campodeæ, as he calls the family to which Mr. Halliday's genus *Iapyx* belongs, containing observations of importance on general entomology. M. H. Krabbe has published the results of some experimental researches upon Helminthology made at Copenhagen and in Iceland, which are particularly valuable in a statistical point of view.

In Botany, M. Œrsted has published, in the Royal Danish Transactions, a detailed account of the experiments by which he proved that *Rœstelia cancellata* and *Podisoma Sabini* were successive states of the same fungus on different plants, and he has since carried out his experiments as to two other species of the same supposed two genera. He has also continued some descriptions of his Central-American plants, and attempted a new classification of the genera.

*Quercus*, *Castanea*, and their allies. Whether his genera prove to be more satisfactory than those previously adopted or proposed remains to be ascertained. Probably the whole are best considered one large natural genus, divisible into sections more or less definitely circumscribed; but Œrsted's primary division, derived from the styles, appears to be at once more definite and more natural than any previous one.

### Sweden.

Professor Malm's 'Monographie illustrée du Baleinoptère' is a most interesting account of the great Rorqual captured on the Swedish coast, with an admirable description of its structure, illustrated by woodcuts and photographs. M. Wallengren has inserted a memoir on the Heterocerous Lepidoptera of Caffraria, in the Transactions of the Royal Swedish Academy. Dr. Stål has completed his work entitled 'Hemiptera Africana.' The 8th and 9th volumes of C. G. Thomson's 'Skandinaviens Coleoptera' have recently appeared, and Messrs. Malmgren and Kinberg have communicated to the Royal Swedish Academy papers containing descriptions of numerous species and new genera of Annelides.

The botanical contributions most worthy of notice are:—Anderson's sketch of the vegetation of Sweden, chiefly as to cultivated plants, translated in the Annales des Sciences Naturelles; and O. Norstedt's observations on the germination of Characeæ, in the Lund Transactions for 1865, but not, as far as I am aware, actually published till 1867. Th. M. Fries has also published, in the Transactions of the Royal Swedish Academy, an enumeration of the lichens of Spitzbergen, remarkable for the great number of species found in those high latitudes, even at an elevation of 2300 feet.

### Russia.

Russian naturalists have been chiefly engaged in the investigation of the natural history of the remote provinces of their vast empire. Early in 1866 a report reached St. Petersburg that a native trader had ascertained the existence of the remains of a Mammoth, with the skin and soft parts still perfect, in a ravine on one of the bays of the estuary of the Ob; and this report seemed sufficiently authenticated to justify the Academy in the immediate despatch of a scientific expedition to examine the remains *in situ*, and bring them over to the capital. Magister F. Schmidt, who was already personally

acquainted with the natural history and, especially, the botany of Northern Siberia, offered himself for the purpose, and was expedited under the sanction and with the aid of the Government. V. Baer, in laying before the Academy the instructions given to M. Schmidt, entered into a detailed review of all that was more or less authenticated relating to previous discoveries of Mammoth-remains in the frozen regions of Northern Siberia, which, as well as the subsequent communications from M. Schmidt, is published in the Proceedings of the Academy. The reports proved to have been highly coloured. Nothing had been found but detached bones and portions of skin and flesh. M. Schmidt appears, however, to have collected numerous data bearing upon the question discussed by V. Baer:—Did these animals ever live in those high northern latitudes? or were their remains brought down in a half-decayed state with the huge masses of ice borne by the floods of these great rivers, and prevented from further decay by becoming buried in frozen masses until accident again exposed them?—the fleshy parts when discovered having been invariably in a state of putrefaction. My friends in St. Petersburg inform me that M. Schmidt is preparing for immediate publication the natural-historical results of this expedition, which, however, are richer in botany than in zoology.

Dr. Strauch has published, in the Mémoires de l'Académie de St. Pétersbourg, a synopsis of the living species of Crocodiles, with especial reference to those represented in the Museum of St. Petersburg; Dr. Brandt, in the Bulletin, a paper on the Dodo; and Professor Kowalewski, in the Mémoires, one on the development of the Ctenophora. Various papers on Russian Entomology have appeared in the Bulletin de la Société Impériale des Naturalistes at Moscow; and the 'Horæ Entomologicæ' of the St. Petersburg Entomological Society are actively continued.

The botanical establishment at the Imperial Botanical Garden at St. Petersburg has been entirely reorganized under the active direction of M. Trautvetter; and by attaching to it three head botanists, for the three several departments of systematic, physiological, and cultural botany, he hopes to give a great impulse to the study of the science. In the meantime Trautvetter himself, Regel, Ruprecht, and v. Herder have been working up the extensive contributions to the floras of different provinces of their vast territories which had been lying waste in their herbaria, especially those of Schrenck, Radde, Semenow, &c. Maximowicz, whose travels in Mandschuria and Japan had produced such rich materials, has been retarded in

the publications he was preparing by the state of his health, which obliges him temporarily to seek a milder climate. Rosanoff, said to be a young man of great promise just appointed to the place of physiological head botanist, is the author of some morphological and development papers. Famintzin and Baranetzki have published, in the Bulletin of the Academy, papers on the development of gonidia in Lichens, in which they notice the formation of zoospores within the gonidia in genera standing so wide apart in the system that they expect to meet with similar results in other lichens. They have also observed the transformation of these gonidia into bodies heretofore supposed to belong to the freshwater unicellular Algæ—a transformation also observed by Dr. Itzigsohn. These papers of Messrs. Famintzin and Baranetzki, as well as others by M. Famintzin, on the action of light on various Mosses and Algæ, and on the coloration of leaves, have been more or less reproduced in the Botanische Zeitung, and in the Annales des Sciences Naturelles. M. A. Fischer v. Waldheim has inserted, in the Moscow Bulletin, a detailed paper on the spores of Ustilagineæ.

### Dutch Netherlands.

M. F. B. L. Pollen, since his return from Madagascar, whither he was accompanied by M. van Dam, has devoted a considerable portion of his time and means to the investigation of the natural history of that island, and is now directing his attention particularly to the Lemuridæ, which seem there to have their headquarters. He has, however, published only a first part of his 'Contributions à l'Histoire Naturelle des Lemuriens,' in the largest folio. This first part consists only of a single plate with a life-size figure of a species of *Microcebus*, with a descriptive text. M. Pollen is also preparing an account of his expedition, accompanied by "Recherches sur la Faune du Madagascar et de ses dépendances," in which he is assisted by some of the first zoologists of Holland and Belgium. Already two parts, relating to Mammalia and Birds, by Schlegel, have appeared. Professor Schlegel's 'Revue critique et méthodique du Muséum des Pays-Bas' has been continued; and the same distinguished zoologist has produced three parts of a work on the Birds of Netherlands-India (Vogel van Nederlandsch Indië) containing admirable monographic revisions, illustrated with fine plates of separate groups of Dutch-Indian birds. Dr. Bleeker has completed his great 'Atlas Ichthyologique des Indes Orientales Néerlandaises;' and Dr. Snellen v. Vollenhoven has issued the third part of his

'Faune entomologique de l'Archipel Indo-Néerlandais,' containing descriptions and figures of numerous species of Pentatomides.

The Botanical works of general interest are chiefly those of Professor Miquel, or published under his direction in the Annales Musæi Lugduno-Batavensis, now in its third folio volume. There are here collected several partial monographs of plants belonging chiefly to the Dutch East-Indian possessions. The greater part, however, of the second and third volumes is occupied by Miquel's own "Prolusio Floræ Japonicæ" (enumerations of the rich collections of Japanese plants in the Leyden Herbarium, with descriptions of new species and genera), forming a valuable repertory of materials for a Flora Japonica, expounded by a botanist of great talent and ability, but which would have been still more valuable had he bestowed the necessary time to introduce more method and given us a complete systematic enumeration of all that is known on that most interesting flora, connected as it is with those of Asia, on the one hand, and of North America, on the other. It is to be regretted also that new genera and species have sometimes been hastily proposed from insufficient data. In the present day it is not only useless, but detrimental to science to establish, for instance, new genera of Umbelliferæ without having seen the fruit. Dr. Miquel has, however, added to his otherwise important labours an interesting essay on the connexion of the flora of Japan with that of other countries.

## Belgium.

The only Memoranda I have of recent Belgian Biological papers of general interest are v. Beneden's on the Polyps of the Belgian coasts, and portions of M. d'Udekem's monograph of the Oligochæta, in the Memoirs of the Belgian Academy of Sciences.

## Germany.

Ernst Haeckel's 'Generelle Morphologie der Organismen,' or General Morphology of Organisms, with the fuller title of 'General Principles of the science of organic forms, mechanically established according to the reformed descent-theory of Charles Darwin,' 2 vols. 8vo, Berlin, 1866, is a work displaying great ability, thought, and philosophical method, and throwing considerable light on the general connexion of organic beings, and the various points of view from which they should be studied. If there may be perhaps in some parts too much of German philosophical speculation and lengthiness, it appears on the other hand to be founded on great general

knowledge of the animal kingdom, as well as accurate and detailed observation of some of its branches. And I learn from Professor Huxley that, though still quite a young man, he is already well known for good work in the investigation of some of the lower branches of animals, especially Radiolaria.

I do not profess to have studied this work in detail; much of it relates to animal forms which are out of my special line: it may therefore seem presumptuous in me to offer any opinion upon it; yet there are a few of its general features well worthy of the consideration of all naturalists, upon which I might be allowed to make a few observations. The points I particularly allude to are:—1st, the general division of the science; 2nd, the relation of organisms to inorganic bodies; 3rd, the supposed mathematical fundamental forms of organisms.

Haeckel's first division of the science, irrespective of any special class of beings studied, is into Anatomy and Morphogeny, one volume being devoted to each. To Anatomy he gives a widely extended meaning, including everything relating to outward form of the individual or its parts, as well as their inner structure, in a complete state; whilst Morphogeny relates to the development of organisms. Anatomy is subdivided into promorphology or the study of outward form, and tectology or that of inner structure; and in Morphogeny he distinguishes the development of the individual and that of the *phylon* or race, a new name introduced to designate the succession of individuals supposed to have descended from any one of the few supposed primitive simple forms.

Further, in subdividing any of these branches, he rejects the old vague distinctions of histology, organology, and general morphology, and proposes six *form-individuals*, which he elsewhere terms *disciplines*, as separate subjects of study in the case of all organisms where they all exist at successive stages of development. It would be useless to translate here his definition of a form-individual, as it would require some study to understand it, and their enumeration will give at once a clearer idea of his meaning. They are:—

1. Plastides or cytodes and cells, cytodes being elementary particles without a nucleus, whilst cells proper are furnished with a nucleus.

2. Organs, compounded of cells in various degrees of complexity.

3. Antimeres, or homotypical laterally opposed parts—the rays of Radiolaria, the symmetrical halves of bilateral animals.

4. Metameres, or homodynamic consecutive parts—the segments,

rings, or zonites of Vertebrata and Articulata, the articles or internodes of phænogamous plants.

5. Persons or Prosopes—individuals in the limited sense of the word as to the higher animals, buds or gemmæ of plants and Cœlenterata.

6. Corms, stocks, or colonies—compound organisms, such as trees and perennial plants, chains of Salpæ, stocks of Polypes, &c.

These six forms, he tells us, are so many grades of development, through which every individual has to pass to attain the higher ones, commencing with the ovum in its primitive state as a simple cell and passing successively through the following ones. The cells multiply and are developed into organs, the sets of organs become arranged into antimeres, these are divided into metameres, and constitute the complete individual of the fifth grade, or are further developed into the compound corm of the sixth; and any one grade may be the permanent form of an individual through life. Thus some of the Algæ, and others of the lowest forms of organisms, are arrested at the first grade of the simple cell; the majority of the higher animals are complete with the fifth form; and the majority of plants and Cœlenterata attain the sixth, others again, according to Haeckel, being arrested in the state of more or less complex organs, antimeres or metameres.

There seems no doubt that this logical distribution of the subject, carefully studied in many of the points of view in which Haeckel has worked them out, may be of considerable service in investigating the complicated structure and relations of the higher organisms, although there are many of the details which appear to me open to criticism as more speculative than founded upon fact. The clear distinction between the fifth form or the individual in the ordinary sense of the term, and the more compound corm or sixth form, will serve especially to dispel much of the speculative obscurity in which the discussion as to what is an individual has been involved. The importance of the separate study of antimeres and metameres as different stages of development may, on the other hand, be too much insisted upon by Haeckel. In most cases their development appears to me to be rather simultaneous than consecutive, and that we may just as well say that the antimeres are made up of metameres as that the metameres are made up of antimeres. But perhaps these forms have acquired more than usual importance in Haeckel's mind from their bearing upon his reduction of the complicated forms of organisms to mathematical types.

To this investigation of the fundamental forms of organisms a considerable portion of the first volume is devoted, displaying great ingenuity, but apparently always dominated by the desire to compare the laws regulating the forms of organisms with those of crystallization of inorganic substances. Admitting, as he does, that the firm-fluid (festflüssig) consistence of organic matter produces those rounded surfaces, curved lines, &c. which are entirely wanting in crystals, and that the typical forms of organisms are subject to unlimited modifications through development, adaptation, and composition, he yet maintains that they are reducible, like crystals, to ideal, mathematical, angular or polyedric forms; and the principal ones of these typical forms are described in detail, and arranged in classes, families, genera, and species. The great fallacy that pervades this part of the work appears to me to lie in the inattention, in this instance, to that fundamental difference between the crystallized and the organized body which he elsewhere expounds—the former consisting of the aggregation of a number of angular elements, the latter of the development of a single globular or rounded cell, growing by expansion or emission from one or more points in the interior. In the former case, general form is more or less affected by that of the elements, and angularity is the rule; in the latter, it depends on the number, direction, relative position, and comparative extent of the emissions or points of growth, and angularity is the exception. In the great majority of organisms distinguished by Haeckel under the name of Axonia, there is a central axis growing longitudinally by the extension of the poles, and laterally in two opposite, or more than two radiating directions. When this growth is regular, a form is indeed produced so far mathematical, as the rays diverge at regular angles, and, growing to equal lengths, form a regular, more or less angular outline. In the Vertebrata there is also generally correspondence between the respective parts of the two opposite antimeres, which retain their parallelism with the axis; but there is great dissimilarity between the different parts of each antimere; and in plants the parallelism of the antimeres is usually disturbed by more or less of a spiral twist. As there is often some regularity in this disturbance, mathematical botanists have been able to establish more or less fixed laws of *phyllotaxis*, the study of which may some day lead to the investigation of the disturbing causes, of which we are as yet wholly ignorant. But to learn that the fundamental form of a Primrose is a regular five-sided pyramid, to be classed under the species Pentaclinota of the genus Isopola, belonging to the class of homostaurous

Stauraxonia—or that an Orchis is founded on a half six-sided amphithected pyramid—or that *Homo* and *Fumaria*, Man and Fumitory, are equally reducible to homopleurous Dipleura, of which the fundamental form is a simple pyramid, with two symmetrically equal lateral halves—appears to be far too fanciful to contribute much to the advance of our science, which, I can only repeat, is essentially a science of observation. We should, indeed, be disposed to class much of such speculation with that *Speciesspielerei* (or play at species) of museum-zoologists and herbarium-botanists against which Haeckel so indignantly protests, comparing it to the amusements of collectors of postage-stamps and similar trifles.

A proposition which is, I believe, more or less supported by some philosophical naturalists in this country, as well as on the continent, and much insisted upon by Haeckel, is that there is no such great difference as is commonly supposed between organic (meaning, I presume, living) and inorganic bodies, that the differences, indeed, are not absolute, but pass one into the other through intermediates. In support of this view he observes :—

1. That the idea of organism, as founded on morphological bases, now fails; for the definition of a living organized body as one which is composed of organs or definite heteromorphous parts working together for the benefit of the whole, is invalidated since we have become acquainted with numerous absolutely structureless and homogeneous plasma-bodies, which, from this supposed simplicity, he classes under the name of *Moneres*, such as *Protogenes*, *Protamœba*, &c. Can this absolute simplicity, however, be really predicated of his *Protogenes primordialis* and *Protamœba primitiva* described in the note to vol. i. p. 133? He could, indeed, detect no structure under the most powerful instruments; but these bodies absorbed nutriment, assumed an egg-like form, emitted and withdrew again one to three or four short processes, and finally separated into two halves, each of which gradually assumed the parental form, and emitted similar processes. Is not this evidence that a complex structure exists, although so exquisite as to escape detection by any means of observation at our disposal?

2. That in all the general fundamental properties of matter, there is not the slightest distinction between organisms (I presume always he means living bodies, not dead organic substances) and inorganic matter; that the reciprocal action of the attractive or cohesive force of the atoms of matter, and the repulsive force of the atoms of ether, are the same and are equally varied in both by the quantitative

diversity of the atoms; that both are equally affected by chemical agents, and especially by carbonic combinations; only, he afterwards adds, these carbonic combinations are much more complicated in organized than in inorganic bodies. But is not this very complication, by which the ordinary action of physical or chemical agents is checked or modified, one of the great and constant differences between the living and the inorganic body?

Rejecting, then, all distinctions derived from morphology or chemical action, Haeckel rests the definition of Organisms upon purely physiological grounds, giving it the following form:—"We call Organisms all those natural bodies which exhibit the peculiar active phenomena (Bewegungserscheinungen) of *life*, and especially the universal one of nutriment"—an excellent definition as far as it goes, and all we could wish for, but that he adds, in a note, "The three functions of nutrition, growth, and reproduction (Fortpflanzung) are commonly designated as the general active phenomena attributable to all organisms; we have not here adduced growth, because it occurs equally in inorganic individuals; nor reproduction, because it is wanting in many (asexual) organic individuals." He must, however, be aware that when growth is attributed to living and denied to inorganic bodies, what is meant is not growth in that comprehensive sense given to the word by Linnæus in the oft-quoted definition of "Lapides crescunt, &c.," but growth by intussusception and assimilation, as distinguished from external aggregation—a contrast well worked out, as characterizing the two great classes, by Haeckel himself (vol. i. p. 141 *et seq.*),—and that reproduction includes asexual as well as sexual reproduction.

With the above definition of an Organism, the whole of the arguments by which he attempts to show that there is a wider gap separating his Moneres from other organic bodies than from inorganic ones appear to me to fail, or to rest solely on the supposed absolute simplicity of these organisms. But the only evidence in favour of this simplicity and homogeneity is the negative one that our instruments can detect no internal structure, whilst the only positive one, the facts of their nutrition, division, development, and alterations of form, as in the *Protogenes* and *Protamœba* above alluded to, tells in the contrary direction.

As to the question of the autogony, spontaneous generation, or original formation of simple organisms out of inorganic matter, and the comparison between the formation of a primordial cell and an elementary crystal, notwithstanding the ingenuity of some of his

arguments, the whole appears to me to be so purely speculative, with the total absence of ascertained facts to rest any theory upon, that it seems out of our province to dwell upon it.

The really important part of Haeckel's work appears to be the second, or morphogenetic volume, or development of the theory of affinity derived from a common descent, which, as he truly says, has been more or less broached by various philosophical naturalists of the present century, but to which Darwin has first given us the key. The methodical views here displayed, notwithstanding their speculative tendency, require more study than I have as yet been able to bestow upon them; but a perusal of the principal chapters points out as the most remarkable parts the classification of the different modes of reproduction and development with reference to the six form-individuals distinguished in the first volume, the methodical exposition of the Darwinian laws of inheritance, variability, and selection, and the attempt at a classification of organisms according to what may, with more or less of plausibility, be conjectured as to their descent and succession through the various geological epochs. In all these cases the chief defect is, perhaps, too much of absolute dogmatism, without distinction of those different degrees of certainty, probability, or doubt so admirably discussed by Darwin. In the classification, the establishment of the intermediate class of Protista, for those comparatively simple organisms which appear to connect the lower animals with the lower plants, is an attempt, which may or may not be successful, at supplying more definite lines of demarcation than those which are now vainly sought for between the animal and vegetable kingdoms.

The repeatedly discussed question of species is here treated at some length. We can all argue as to the identity or distinction of species; but none of us can give a really definite reply to the question What *is* a species? Those who insist on the absolute fixity of the limits of species can give us no rule for the ascertainment of those limits which does not occasionally break down; those who deny that there are limits to species yet constantly speak of species as if they had limits. The object of a paper recently communicated by Darwin, and now printing in our journal, is to show that *Primula vulgaris*, *P. veris*, and *P. elatior*, Jacq., are distinct species; and Haeckel himself has frequently to speak of species like other naturalists. He argues, as others have done, that all morphological and physiological tests of species fail in particular instances, that the ordinary idea of a species is purely arbitrary and artificial (ii.

p. 340), but that species are (p. 353) genealogical individualities, subordinate to that of a phylon, which it is practically necessary and possible to distinguish and to name. Then follows his definition of a species, which I subjoin in a note, as to me it appears as difficult to translate as to apply practically when translated *.

Prof. C. Claus, of Marburg, has published a handbook to the ordinary classification of animals, under the title of 'Grundzüge der Zoologie,' in two vols. 8vo; and in a memoir on the Copepod Crustacea of Nice has shown a strong tendency to the adoption of Darwinian theories. The continuation by Dr. Gerstäcker of the Arthropod section of Bronn's 'Klassen und Ordnungen des Thierreichs,' mentioned in my address of 1866, advances but very slowly. Prof. Gegenbaur's latest work on Comparative Anatomy, 'Untersuchungen zur vergleichenden Anatomie der Wirbelthiere,' comprises two parts, the first relating to the carpus and tarsus, the second to the shouldergirdle of Vertebrata and the pectoral fins of fishes. Dr. Peters of Berlin, whose active services in the cause of zoology you have acknowledged by electing him to fill the last vacancy in the list of your foreign members, has recently published memoirs on the Aye-Aye, on Bats, and on Eared Seals. A posthumous memoir by the late H. Rathke, on the development and structure of the Crocodile, the last great work of its distinguished author, has been brought out, under the care of Dr. v. Wittich, in the Nova Acta Naturæ Curiosorum.

Kner and Steindachner have, in the Transactions of the Academy of Munich, described the new genera and species of fish from Central America collected by Moritz Wagner, who has himself added an Essay on the hydrographical conditions and on the geographical distribution of freshwater fishes in the states of Panama and Ecuador, containing several statements of considerable interest—amongst others, that there are some (although, he admits, very few) species quite identical in the marine estuaries of the opposite sides of the isthmus, contrary, he says, to the dictum of Darwin in the 'Origin of Species,' the merits of which work he otherwise fully

* "Die Species oder organische Art ist die Gesammtheit aller Zeugungskreise welche unter gleichen Existenzbedingungen gleiche Formen besitzen." If we render this as "the species is the sum of all the generation-cycles which, under similar conditions of existence, possess similar forms," the question suggests itself, What is a generation-cycle? In reading his long chapter on the subject, in the hopes of obtaining a clear explanation, I only felt more bewildered; nor can I find any clue to an important point in the definition—what degree of variation similarity admits of.

acknowledges. And in this case Darwin does not put the case so absolutely as indicated by Wagner; for his expression is, "No two marine faunas are more distinct, with *hardly* a fish, shell, or crab in common, than those of the eastern and western shores of South and Central America." This *almost* universal dissimilarity appears to be confirmed by Wagner; for I believe that his identical species of fish are confined to a single one.

Dr. Heller has communicated to the Academy of Sciences of Vienna a paper on the Amphipoda of the Adriatic. Amongst arachnologists, Dr. L. Koch has nearly completed a monographic treatise on the great family Drassidæ; Dr. A. Menge has commenced a very detailed revision of the Spiders of the Province of Prussia; the Zoologico-botanical Society of Vienna have published a posthumous monograph, by Dr. Prach, of the Thomisidæ of the neighbourhood of Prague; and the curious Bear-animalcules (Tardigrada or Arctiscoida), now referred by all zoologists to the Arachnida, have of late received considerable attention from Dr. R. Graeff, whose elaborate structural descriptions of these minute creatures are inserted in the Archiv für mikroskopische Anatomie.

In entomology, the Zeitschrift für wissenschaftliche Zoologie contains several anatomical papers, amongst which M. Weismann's on the metamorphosis of the Diptera are of particular value, and lead to new views on the nature of insect-metamorphosis in general; and M. Mecznikow's on the reproduction of *Aphides* maintains a view of these phenomena nearly in accordance with that so admirably set forth in our Transactions some years ago by Professor Huxley, and in contradiction to the opinions of M. Balbiani, communicated to the Academy of Sciences in Paris, who endeavours to prove that the viviparous individuals of those insects are to be regarded as true hermaphrodites (!). An excellent review of the whole subject is given by Prof. Claparède, of Geneva, in the Annales des Sciences Naturelles. The last volume of the Nova Acta Naturæ Curiosorum contains an elaborate paper by Dr. Leydig on the ovary and seminal receptacle in insects, and another by Dr. Landois on the Anatomy of *Pulex canis*.

A remarkable fossil insect has been described by Dr. A. Dohrn, in Dunker's 'Palæontographica,' under the name of *Eugereon Boeckingi*, which is cited by him in an interesting paper in the Stettiner entomologische Zeitung as an illustration of Haeckel's genealogical views. He includes the whole of the Orthoptera and Neuroptera of the old writers in an order to which he gives the name of Toroptera,

and which he regards as representing the earliest type of insect life. From it he assumes that the other two orders of masticant insects have proceeded very early, whilst the suctorial forms originated at a later period. But *Eugereon* combines the wing-characters of the Toroptera, with such a modification of the mouth-organs as to indicate pretty clearly an approach to the suctorial Hemiptera; and both Haeckel and Dohrn seem inclined to regard it as representing one of the stages in the branching-off of the latter from the main gencalogical stem. In all such speculations, however, we must recollect how very scanty are the data upon which we can found them. The isolated forms the remains of which have been preserved to us in the formations of early geological periods probably represent but an infinitesimally small proportion of the varied organisms then existing, and, as observed by Haeckel in regard to the more numerous remains of shells, give us not only a totally inadequate, but, in many cases, an absolutely erroneous idea of the relative preponderance of the different classes of beings living at any one time.

Dr. Suffrian has completed his monograph of South-American Chrysomelidæ in the Linnæa Entomologica of Stettin. A new periodical, the Coleopterologische Hefte of E. v. Harold, does not confine itself to European forms, but promises to supply valuable general memoirs on Coleoptera; and the editor announces the approaching publication in its pages of a general catalogue of the species of this order.

Gabriel Koch has published, at Leipzig, an essay on the geographical distribution of Lepidoptera, under the title of "Die indo-australische Lepidopterenfauna in ihrem Zusammenhang mit der europäischen," in which he advances some new views in zoological geography as regards the Lepidoptera, from the consideration of which he proposes to divide the surface of the earth into three great regions. Of these, the European includes the whole of Northern Asia, and America north of 60° N. lat.; the American is formed by the remainder of the western continent; and the Indian, or South-Asiatic, extends through Malasia and Polynesia to Australia. This division is illustrated by the author with considerable detail. His chief difficulty appears to be with the African continent, which, although allied to that of Europe (with which he joins it), especially in the natural productions of its northern part, certainly exhibits strong Indian proclivities in its Lepidoptera, as well as in some other groups of animals. These regions may, in some measure, be confirmed by

the general distribution of the vegetable kingdom, with the addition, however, of a perfectly distinct centre for the characteristic Australian flora, and perhaps also for that of South Africa.

Leuckart's work on the Parasites of Man has now reached the second part of vol. ii. Dr. A. Schneider has published a monograph of Nematodes, exhibiting, in a striking manner, a combination of accurate research and felicitous generalization. Semper's beautiful work on Holothuria, forming the first three parts of the scientific results of his travels in the Philippine Islands (Reisen in dem Archipel der Philippinen, wissenschaftliche Resultate), although professing only to give the details of his own observations, is, in reality, an almost exhaustive monograph of the group. The histology of the Cœlenterata has been treated by Kölliker in his 'Icones histologicæ;' and Oscar Schmidt has published a second supplement to his 'Sponges of the Adriatic,' containing a discussion of Bowerbank's genera, and also a part of his great work on Infusoria.

The Zoology of the voyage of the 'Novara,' consisting neither of monographs nor of faunas, nor yet of any exhaustive treatise upon any one zoological subject, is simply a repertory of detailed descriptions, and, however useful these may be as additions to our stores of species known, need scarcely have been mentioned here, but for the beauty of the illustrations with which some of the parts are accompanied. The parts recently published are:—Fish, by Kner; Reptilia and Amphibia, by Steindachner; Mollusca, by v. Frauenfeld; Lepidoptera (parts 2 and 3 completing the Butterflies), by Felder; Hemiptera and Neuroptera, by G. L. Mayr and F. Brauer; and Annelida, by Grube.

In Botany, Germany has supplied us with some general speculative essays which I have not as yet had time to go over. Such are:—Ernst Krause's Systematic Botany in relation to morphology, mentioned in the Bulletin de la Société Botanique de France for 1866; Nägeli's speculations on hybridism and on species, in the Proceedings of the Royal Academy of Munich; besides others by other writers in the Botanische Zeitung and other periodicals, many of them taking up more or less of Darwinian principles.

Hofmeister's Handbook of physiological Botany, mentioned in my address of 1866, is, contrary to expectation, not yet completed, and the detached papers on various points of vegetable physiology are far too numerous to be here particularized; I would, however, call your attention in a few words to Hildebrand's 'Geschlechtervertheilung bei den Pflanzen,' or distribution of sexes in plants. This

is a methodical summary of recent observations (his own and others') on the mutual relations of the sexual elements in plants, and more especially the means by which the cross fertilization of separate individuals by insect agency, or otherwise, is effected, preceded by a short sketch of the history of the subject. Christian Conrad Sprengel, towards the close of the last century, in a remarkable work, long forgotten, but now recalled to our notice by Darwin, Hildebrand, Delpino, and others ('Das entdeckte Geheimniss der Natur, &c.', "The disclosed secret of Nature in the structure and fertilization of flowers"), first announced, as a fact, that the majority of flowers which secrete honey are incapable of self-fertilization, but are cross-fertilized by means of insects which visit them in search of that honey, illustrating this proposition by more or less detailed observations on between four and five hundred plants. Similar observations, on the evident impossibility in so many flowers of the stigma being acted upon by the pollen of the accompanying stamens, appear to have been brought forward by Henschel in 1820, in the attempt at refutation of the established doctrine of sexuality in plants; but all these observations were generally disbelieved or ridiculed, for as yet no plausible hypothesis had been brought forward connecting the facts observed with the general economy of reproduction. But when Darwin had once pointed out, in his 'Origin of Species,' the true tendency of these curious provisions, and graphically delineated some of the more complicated ones in his 'Fertilization of Orchids,' naturalists in various parts of the world set to repeating his experiments, and many detached papers on the subject have been published by Hildebrand himself as well as by others. The present memoir, in which the facts thus elicited are collected and systematized, affords a fair starting-point for future inquiries on the same subject under different conditions and in different climates.

Very few botanical monographs of any importance have been recently published in Germany. Hanstein has completed his review of Gesneraceæ in the 'Linnæa'; F. W. Klatt has illustrated the genus *Lysimachia*, with detailed descriptions and several plates, in the Transactions of the Natural-History Society at Hamburg, and completed his revision of Irideæ in the 'Linnæa'; and Batka has given a very elaborate monograph of the few species constituting the *Senna* group of the genus *Cassia*. Wimmer has published a monograph of European Willows; and Milde has completed, in the Nova Acta Academiæ Naturæ Curiosorum, his very full and copiously illustrated monograph of *Equisetum*.

Martius's great work on the Brazilian flora, already mentioned in my previous Addresses (which amounts almost to a series of monographs by various authors), is progressing slowly; the portions published since those I mentioned in 1866 have been:—Meissner's Lauraceæ, supplemented by an essay on the geographical distribution of the order in the Transactions of the Royal Munich Academy; Dr. Hooker's Rosaceæ; and Eichler's Combretaceæ.

Dr. Schweinfurth, of Berlin, has at length published the first part of his 'Contributions to the Flora of Æthiopia,' which had, I believe, been long in print, and supplemented it by a monograph of Æthiopian Gum-Acacias in the 'Linnæa.' Prof. Alexander Braun has given, in the Proceedings of the Academy of Berlin, a very detailed monograph of African Characeæ. From Vienna we have had a splendidly illustrated volume, descriptive of the principal botanical results of the spirited, but unfortunate, expedition of the ladies Tinné to Bahr-Ghasal, and another by Wawra, equally creditable to Austrian art, descriptive of plants collected in the earlier voyage to South America of the late Archduke Maximilian, who afterwards met with so deplorable a fate as Emperor of Mexico. Grisebach, who had previously published detached papers on Wright's Cuban collections, has now given a complete enumeration of all the plants known to him, or published as inhabitants of that island; he has also inserted, in the second volume of 'Das geographische Jahrbuch,' a comprehensive review of the progress of Geographical Botany during the years 1866 and 1867, L. K. Schmarda giving in the same work a similar report on the progress of Geographical Zoology.

Amongst a considerable number of smaller works and detached papers of mere local botanical interest, I may mention Schur's 'Enumeratio Plantarum Transsylvaniæ' as relating to a part of Europe less known to botanists than Germany proper. Reichenbach's great 'Iconography of the German Flora' has been steadily progressing, and is now approaching completion.

The Cryptogamic studies of the Germans have been as numerous as those on physiology; but I need only here mention Krempelhuber's 'Geschichte und Litteratur der Lichenologie,' or 'History and Literature of Lichenology,' forming a comprehensive guide, very useful to those who devote themselves to the study of Lichens; and Mr. Currey has called my attention to some remarks of De Bary's in the 'Botanische Zeitung,' on Bornet and Thuret's observations, mentioned below.

Two elaborate works on the injuries inflicted on trees, chiefly by

insects and cryptogams, have appeared:—Ratzeburg's 'Waldverderbniss,' of which one part is still wanting to complete the second volume, and Willkomm's 'Microscopical Enemies of the Forest.' I may also mention Ettinghausen's publications, illustrating by nature-printing the arborescent and shrubby vegetation of Austria, as specially useful to the student of palæontological botany.

## Switzerland.

Geneva continues to be the seat of considerable botanical activity. J. Mueller of Argau's monograph of Euphorbiaceæ, forming the second part of the fifteenth volume of De Candolle's 'Prodromus,' fully justifies the anticipations we had formed as to the scientific merits of the work. Some defects in form have been pointed out by various critics. The want of an index of species will, no doubt, be supplied by a continuation of Buek's Indexes to previous volumes. One much more to be regretted is that innovation in nomenclature by which the author ascribes to himself every species of which he has modified the circumscription. The distinguished editor disclaims all responsibility, for he has given up the attempt to require uniformity in the monographs collected in this great work. The comments, however, which have been made upon the subject have probably been the cause of his taking up the whole question of the laws of nomenclature as recognized by botanists. The great want of some definite rule which naturalists would all be governed by had been felt by many zoologists, and Sir William Jardine several years ago laid the subject before the British Association. Committees were formed, and botanists invited to join. When, however, the code of laws came to be definitely discussed at the Birmingham meeting in 1866, the botanists withdrew; for the practice amongst us had been much more settled than it appeared to have been amongst zoologists, and we felt that laws laid down long since by such men as Linnæus, De Candolle, and the Jussieus, founded on what appeared to them the best suited to the objects in view, and sanctioned by custom, carried much greater weight than the decisions of any majority of a fortuitous assemblage of gentlemen, some, no doubt, of great experience, but others quite ignorant of the practical working of any disputed regulation. I have not heard how far zoologists have generally considered their code sufficiently settled to ensure obedience. Amongst botanists there have appeared of late, unfortunately, symptoms of opposition to established custom,

especially with regard to that personal rather than scientific question, Whose name or whose initial letters should, in the binomial nomenclature, be added to the double name of a species (generic and specific) to distinguish it from others which may have received the same name from other quarters? M. A. De Candolle having raised a discussion on this and some other points, he was requested to bring the whole subject before the meeting of the Botanical Congress at Paris last summer. He accordingly reduced the most generally acknowledged regulations to the form of a body of laws, which was laid before the Congress, modified, but perhaps not improved, in some small details in the discussion which ensued, and finally put to the vote, and adopted, as I believe, unanimously by the gentlemen present. These 'Laws of botanical nomenclature' have since been published in French and in English, and form an excellent guide, which it is sincerely to be wished that systematic botanists would conform to. In submitting to it, our reliance would be rather on the great knowledge of the subject, the experience and judgment of M. De Candolle, than on the fiat of a body of men, which those who were not present do not seem generally disposed to acknowledge. Two, indeed, of those who were actually present and joined in the vote, M. Desmoulins of Bordeaux, and M. Crépin of Ghent, have published long protests against the interpretation given in De Candolle's commentary to the clause which regulates the above-mentioned disputed point, averring that, when they voted, they understood it in a diametrically opposite sense.

Of Boissier's 'Flora Orientalis,' the first volume, containing the orders which in the Candollean arrangement precede Leguminosæ, has been published, and will be duly appreciated by all botanists as the first complete and methodical account of all that is known of the vegetation of that most interesting region vaguely designated as the Levant or the East, the cradle of civilization, and the probable scene of some of the earliest attempts at cultivation. To those who are searching into the origin of our cultivated species, or who are attempting the identification of the plants mentioned in the biblical and other early records, the accurate description of those now to be found in the country is of the greatest importance; and it is sincerely to be wished that M. Boissier's work may be vigorously prosecuted and brought to an early conclusion.

M. Casimir De Candolle, from his study of Piperaceæ for the 'Prodromus,' has been led into various inquiries as to the arrangement and formation of the organs of vegetation. His earlier paper

on phyllotaxis has now been followed up by some interesting observations and studies on the organogenesis and homology of the leaf, of which I have just received a separate reprint from the Bibliothèque Universelle, under the title of 'Théorie de la Feuille.' He considers the leaf as a branch of which the development has been arrested, comparing it also with the cup (or hypanthium of the Germans) in the Rosaceous flower, and details his evidences, derived chiefly from the examination of the position and direction of the vascular tissue, with considerable ingenuity. Whether his conclusions are or are not to be adopted is a question requiring more study than I have as yet been able to bestow upon it, before expressing any opinion.

From Grisebach's review of the progress of Geographical Botany I learn that Dr. Christ has published a valuable essay on the distribution of the plants of the Alpine regions of the European chain of Alps—a work which I have not met with myself, but in which it appears that he claims for the mountain-chains of the mainland of Europe and Asia the site of the centre of that flora which has received the name of the Scandinavian peninsula.

## Italy.

I have no memoranda on any special zoological works published in Italy within the last two years. F. de Filippi has transmitted to the Academy of Sciences of Turin a series of observations on Marine Animals made during a voyage to Gibraltar, Rio Janeiro, Batavia, Cochin China, Japan, and China; and Signor Doria's expedition to Borneo appears to have been very successful in its zoological as well as its botanical results. Signor Beccari, who accompanied him, has spent above two years in thoroughly exploring the territory of the Rajah of Sarawak. He is now on his way home, or has already returned to Florence, whither his friend Doria had preceded him, and where we hear the whole of their very rich zoological and botanical collections have safely arrived. They purpose immediately to prepare them for publication, probably in a separate work on the flora and fauna of Sarawak.

In Botany nothing has been done yet towards completing the Flora of the Peninsula worked out according to natural orders, so elaborately commenced by Parlatore. The venerable Bertoloni, now above ninety years of age, has issued a second part or volume of the Cryptogamic portion of his 'Flora Italica,' containing the Algæ, which, however, I have not myself seen. Caruel, who com-

pleted in 1860 an excellent enumeration of Tuscan plants, has unfortunately been disappointed in his candidateship for more than one botanical post, which would have afforded him the desired opportunities of prosecuting his favourite studies. He has, however, published several short papers on European Cyperaceæ, and on various phytological questions which he has investigated.

F. Delpino has published at Florence an Essay on the Fertilizing-apparatus in Phænogamous Plants, which Hildebrand has reproduced in the 'Botanische Zeitung,' with notes and additions, and of which we have also a summary in Mr. Murray's 'Journal of Travel and Natural History.' Delpino in this essay details his observations on dichogamy and cross fertilization of insects, in confirmation of those of Sprengel, Darwin, and Hildebrand, in the case of various plants belonging to about twenty natural orders. Another pamphlet of his, 'Thoughts on Vegetable Biology,' is purely speculative, without, as far as I can discover, a single corroborative observation. He is a great admirer of Darwin's views of affinity depending on descent, but wholly discards Natural Selection, substituting for it, in plants, "a plasmatic principle, endowed with intelligence," by means of which he supposes that the plant itself modifies the forms of its flowers so as to secure the necessary agency of insects in fertilizing them. Pasquale, who has succeeded the late Dr. Gasparrini in the professorship and direction of the Botanic Garden at Naples, has published a Memoir on Heterophyllism, and a few papers in the Proceedings of the Neapolitan Academy. Detached accounts of Italian and Sicilian plants, chiefly cryptogamic, have also appeared in various Proceedings and Journals.

## Spain.

In Spain the effects of a slight spur which had been given to the study of Natural Science about the time when I visited Madrid in 1859 appears to have died away. I can find no announcement of any biological publication, except an Enumeration or List of Spanish Cryptogams by Colmeiro. I hear that Lange and Wilkomm's Synopsis of the Spanish Flora is now likely to be continued; but to that the Spaniards themselves have not contributed. A very interesting fact in the distribution of plants, that of a *Dioscorea* inhabiting the Spanish Pyrenees, has also now been verified, and the plant figured and described—again not by a Spaniard, but by Grenier, in the 'Bulletin de la Société Botanique de France.' I observe, in

Agassiz's 'Journey to Brazil,' that he met, on the Amazons, with a Spanish scientific expedition on their return home; but I have seen no notice of it or of its results in any other place.

## France.

Professor Milne-Edwards's Report on the Recent Progress of Zoology in France furnishes an interesting *résumé* of the numerous discoveries made of late years, and may be read with great profit, notwithstanding a not unnatural tendency rather to underrate the labours of zoologists belonging to other nations than the French. No one can deny, however, the very prominent position which that nation has always taken, and still continues to take, in the pursuit of Biology; and it is with very great satisfaction that we find that the splendid series of Memoirs issued from the Muséum d'Histoire Naturelle has been resumed under the title of 'Nouvelles Archives.' In this publication, as in other periodical issues by French scientific bodies, the very inconvenient habit of antedating (dating the several parts from the time they ought to have been, instead of that when they actually were published) renders it exceedingly difficult sometimes to ascertain the real year or month when particular observations or discoveries ought to take their place in the chronological records of science. The Memoirs now mentioned are those which, as we presume, have been really issued since the commencement of 1866. The most important zoological ones in the 'Nouvelles Archives' are MM. Gratiolet and Alix's "Recherches sur l'Anatomie du *Troglodytes Aubryi*," M. P. Fischer's paper on the genus *Ziphius*, and M. Alphonse Milne-Edwards's description of a small Rodent under the name of *Lophiomys Imhausii*, which he regards as the type of a new family in its order. It appears to be most nearly allied to the Muridæ, but shows relations to the Porcupines. M. Milne-Edwards has described the anatomy of this animal at considerable length, and illustrated it upon several plates. Unfortunately the native country of the creature, which was purchased at Aden, is unknown. M. Aug. Duméril's Prodromus of a monograph of Sturgeons is also in the 'Nouvelles Archives.'

M. Pouchet has published two parts of an elaborate work on the Great Ant-eater. M. Gratiolet has given us a Memoir on the anatomy of the Hippopotamus, and M. Alphonse Milne-Edwards, in the Annales des Sciences Naturelles, anatomical observations on some Mammifera of Madagascar and of China. The same zoologist, as

well as Messrs. Gervais and Coquerel, have detailed the skeletal characters of the Dodo.

Prof. Lacordaire, in the seventh volume of his 'Genera des Coléoptères,' has concluded his classification of Curculionidæ, together with that of the two or three smaller families which, with the true Weevils, constitute the great division of the Rhynchophorous Beetles. That there is much difference of opinion among entomologists as to the value of the principles upon which Lacordaire has founded his main divisions of Curculionidæ cannot be denied; but whatever views may be entertained upon this point, there is no doubt that he has made a great step towards the reduction of an excessively difficult and hitherto almost chaotic group into something like order. The Abbé de Marseul's periodical 'L'Abeille,' which has been regularly continued, seems at present to be entirely devoted to European Coleoptera, several groups of which have been treated monographically in its pages.

M. Quatrefages's great work in the Suites à Buffon, the 'Histoire Naturelle des Annelés marins et d'eau douce,' notwithstanding some grave defects (which have been indicated by M. Claparède of Geneva), must be regarded as making an epoch in the study of Annelides. To all future investigators of these interesting creatures it will be indispensable; and the wonder is, considering the difficulty of the subject, not that the author should have fallen into some errors, but that he has succeeded so well in bringing together the elements of our knowledge of so intricate a group. M. Quatrefages includes the Gryphea (Sipunculidæ, &c.) in the scheme of his work, but excludes the Turbellaria.

Amongst the most recent French botanical publications the first place must be given to Le Maout and Decaisne's 'Traité générale de Botanique descriptive et analytique,' in large quarto, of which every page is copiously illustrated with most instructive woodcuts. The first part is a general elementary treatise of morphological and structural botany; and the second and principal part an exposition of the natural orders—not entering into quite so much detail as is done in Lindley's 'Vegetable Kingdom,' but yet in some measure superseding that great work, of which the last edition is now fifteen years old, and which, after the loss of its lamented author, would scarcely admit of a new edition without remodelling so as to make it no longer Lindley's own. MM. Le Maout and Decaisne appear to have verified much by their own observations; and although two or three minor points have been indicated

where, in this as in all general treatises, some recent corrections of old views may have been overlooked, yet the whole work, as far as I have gone into it, appears to me to be admirably done, and to form a most useful guide for all practical followers of systematic botany.

From French systematic botanists we have otherwise had but very little during the last two years, and that little is chiefly of local interest. I believe that some important monographs are in preparation, but have not yet appeared. MM. Brongniart and De Gris proceed but very slowly, and only in a few detailed descriptions, in making known to us the results of the active exertions of their collectors in New Caledonia. We should, indeed, have been almost ignorant of the rich materials afforded by that colony for the elucidation of the affinities and geographical relations of the eastern section of the general Australasian flora, but for the spirited liberality with which M. Lenormand of Caen has transmitted to Kew sets of the plants received from his New-Caledonian friends. M. Baillon and his friends continue the 'Adansonia' mentioned in my former Address, M. Baillon's own contributions containing many excellent observations, accompanied, however, by views in which few botanists will probably concur, and occasionally attended by symptoms of hasty rivalry much to be regretted. With regard to French Floras, Ardoino has published one, of the newly annexed Department of the Alpes Maritimes; and Mr. Munby has given us a revised and complete enumeration of Algerine plants. The numerous detached papers on French plants have chiefly related to local forms and so-called critical plants, and need no further mention on the present occasion. I cannot, however, forbear the expression of a regret that MM. Jordan and Fourreau should have wasted so much talent and expense on their splendidly illustrated work entitled 'Icones ad floram Europæ novo fundamento instaurandam spectantes,' devoted as it is to the elucidation of the most trifling varieties of well-known plants.

The 'Annales des Sciences Naturelles,' the 'Comptes Rendus,' the 'Bulletin de la Société Botanique,' and the Transactions of provincial Societies contain numerous useful papers on various points of vegetable physiology. M. Naudin continues his researches on Cucurbitaceæ; and M. Godron has published some new experiments on hybridity. M. Trécul has added several new papers to his observations on the laticiferous and other vessels, M. E. A. Carrière on the production and fixation of varieties, M. Chatin on tendrils and on anthers, M. Planchon on dimorphism in the flowers

of the cultivated vine, M. Prillieux on the vegetation of Orchids, M. Blondeau and M. Paul Bert on the motion of sensitive plants, besides many others of real interest, although on small matters—not to mention new classifications and speculations either quite unmeaning or, like M. Ch. Fermond's six Phytogens the developments of which are supposed to form the basis of the structure of Dicotyledons, about as fanciful as Haeckel's fundamental forms.

In Cryptogamy Mr. Currey has kindly supplied me with the following note on MM. Bornet and Thuret's interesting researches on the impregnation of Florideæ, in the 'Annales des Sciences Naturelles.' The different parts which conjointly form the cystocarp constitute the female organ in the Florideæ; their number and arrangement vary much in different tribes, but amidst all the varieties of form and structure one character at least seems constant: this is the presence of a little appendage of a peculiar nature, to which the authors have given the name of *trichogyne*, because it always assumes the form of a more or less elongated hair, and is the essential organ of impregnation. This operation is effected by the copulation of the corpuscles produced by the antheridia with this trichogyne; and the result is the development of the capsular fruit or cystocarp. The process is traced by the authors in several tribes; but the details are complicated, and would not be intelligible without the figures. The general result, however, is that three principal modifications may be distinguished: impregnation is almost direct in the Nemalieæ, where the cystocarp grows from the very base of the trichogyne; in the other tribes the cells destined to form the spores are distinct from those which support the trichogyne, and are only impregnated indirectly; in *Dudresnaya* the impregnating apparatus is quite detached from the fructificatory one, and a kind of double impregnation takes place, the details of which are extremely curious. Some remarks on these observations, modifying in some respects the views of MM. Bornet and Thuret, are given by De Bary in the 'Botanische Zeitung.'

The following is Mr. Currey's analysis of a paper of Mr. E. Roze, which has also appeared in a recent number of the 'Annales des Sciences Naturelles,' and is evidently a translation from the German; but I have been unable to ascertain whether it has or has not been published in the original. The author's observations led him to the conclusion that if the prolongation of the pollen-tube in phænogams has no other result than that of conveying the fecundating matter to the embryo-sac, the antherozoid in cryptogams ought for its part

to have only the same function to fulfil with regard to the archegonium—that if the contents of the pollen-tube may be properly taken to represent the male element, the equivalent of this male element should be recognizable separately in the antherozoid—and that in fact the antherozoid is composed of two distinct portions, the motile apparatus and the impregnating element. The author's conclusion is that the active antherozoid is in reality only a conducting agent (agent de transport) for bringing about the junction of the two sexual elements.

Dr. Nylander continues his lichenological studies, and has recently published general enumerations of the lichens of New Caledonia and of those of New Granada, the latter as a portion of Triana's 'Prodromus Floræ Novogranatensis.'

The fierce party conflict, of which France was the chief arena, on the question of spontaneous generation, mentioned in my Address of 1863, has been since carried on, although it seems in some measure to have calmed down for want of new facts to argue upon, each party, at least some individuals of each party, professing to have silenced the other. The chief question of fact in dispute seems to be the following:—If an organic substance in dissolution be exposed in an hermetically closed vessel to a heat sufficient to destroy all living organisms or germs it may contain, will living Vibrios appear in it without the admission of the external air supposed to contain their germs? And numerous are the experiments, apparently conducted with the greatest care, which have been brought forward as proving the affirmative or the negative. This was already the state of the case five years ago, and remains so still; and I should not again have mentioned the subject but that some curious facts, bearing upon the question and narrowing in some measure the disputable ground, have been brought forward by some ingenious and evidently careful experiments made by Professor Wyman, of Harvard College, Cambridge, U.S., leading him to the following, amongst other conclusions:—

1. In thermal waters, plants belonging to the lower kinds of Algæ live in water the temperature of which in some instances rises as high as 208° Fahr.

2. Solutions of organic matter *boiled for twenty-five minutes*, and exposed only to air which had passed through iron tubes heated to redness, become the seat of infusorial life.

3. Similar solutions contained in flasks hermetically sealed and then immersed in boiling-water for periods varying from a few

minutes to four hours, also became the seat of infusorial life (gradually more rare the longer the boiling was continued).

4. No infusoria of any kind appeared if the boiling was prolonged beyond a period of *five hours*.

5. Infusoria having the faculty of locomotion lost this when exposed in water to a temperature of from 120° to 134° Fahr.

Thus it would appear that although a heat considerably below that of boiling water will destroy the life of individual infusoria, yet the germs of Vibrios, Bacteriums, and Monads (or, as spontaneous-generationists might say, the faculty possessed by the atoms of organic substances of being converted into living Vibrios) will resist during a longer or shorter period the action of boiling water, but that a limit can be reached, beyond which their destruction is inevitable and no Vibrios are generated or created.

## Southern Hemisphere.

I have on former occasions alluded to the impulse given to the study of Natural Science in Australia by the indefatigable exertions of the distinguished Government Botanist of Melbourne, Dr. Ferdinand Mueller, whose zeal continues undiminished. Obliged by the state of his health to give himself some temporary rest, he took the opportunity of paying a visit to King George's Sound to make himself personally acquainted with the only section of the Australian flora which he had not observed in the living wild state, and, during his short stay there, collected very largely. Among numerous minor labours he has carried his 'Fragmenta Phytographiæ Australis' far into the sixth volume, a valuable repertory of descriptions and observations, the practical usefulness of which, however, is much diminished by the total want of order and method. His Essay on Australian Vegetation, indigenous or introduced, on the occasion of the Intercolonial Exhibition at Melbourne in 1866–67, is full of useful information on a subject which no one is better acquainted with than himself; and it is to be hoped that he may now devote himself to the preparation of the promised monograph of that genus *Eucalyptus* which forms so essential a part of the useful as well as the characteristic vegetation of Australia. Several of his friends, whom he has incited to the pursuit of Botany, have published papers on various subjects, especially Mr. Woolls, of Parramatta, who has collected his various Essays into a volume entitled 'Contributions to the Flora of Australia.'

In Zoology, I observe a considerable portion of the recent volume of the Transactions of the Royal Society of Victoria occupied by Australian Coleoptera described by Count F. de Castelnau.

Dr. Hooker's 'Handbook of the New-Zealand Flora' has been completed. The Industrial Exhibition in that Colony, in 1865, has been the occasion of several Essays, of which those of Mr. Buller, on the Ornithology, and of Dr. Colenso, on the Vegetation of New Zealand, belong to our Science; and from Dr. Lauder-Lindsay, besides several detached papers, chiefly on the Lichens of that Colony, we have a separate Essay, entitled 'Contributions to New-Zealand Botany.'

Messrs. Finsch and Hartlaub have given an account of the Birds of the Viti, Samoa, and Tonga Islands in their work entitled 'Ornithologie Central-Polynesiens;' and Dr. Seemann's beautifully illustrated Flora of the Viti or Fiji Islands has reached its seventh part.

Mr. E. L. Layard's 'Birds of South Africa,' a descriptive catalogue of all known species south of the 28th parallel, published at Cape Town, presents some defects which have been pointed out by various writers, but must be welcome to zoologists as a first attempt to bring together all the birds belonging to an interesting region. Mr. Roland Trimen has published an excellent volume on the Rhopalocerous Lepidoptera of South Africa, and has communicated to us a paper on Mimetic Analogies among the Lepidoptera of South Africa, which will appear in the usual winter part of our Transactions. Dr. Wallengren's paper on South-African Heterocerous Lepidoptera has been already mentioned. There are now in the Cape Colony several active resident botanists who are contributing much towards making us more perfectly acquainted with the extraordinarily varied vegetation of that country, among whom I would specially mention Mr. M'Owan, of Grahamstown, Mr. Bolus, of Graafreynet, Mr. and Mrs. Hutton, of Bedford, and Mr. Sanderson and Mr. M'Ken, of Natal; and although the great 'Flora Capensis,' undertaken by the late Dr. Harvey and Dr. Sonder, has as yet made no progress since the lamented death of the former, yet we hope that arrangements are being carried on for its completion; and in the meantime the new edition of Dr. Harvey's 'Genera of Cape Plants,' which was nearly complete at his decease, is about to appear under the able editorship of Dr. Hooker.

In South America, Dr. Burmeister has established a publishing society at Buenos Ayres; but his papers have been hitherto on Palæontological Mammalogy, which does not come within the scope of my review. Dr. Fritz Mueller, of Desterro, continues to send over in-

teresting papers; amongst others, he has sent a curious one describing a new species of *Balanus* (*B. armatus*), as well as a singular form which he regards as a hybrid between this and Darwin's *B. improvisus*, var. *assimilis*. I cannot, also, pass over in silence the active exertions of M. Correa da Mello, of Campinus in Brazil, whose admirably selected botanical specimens and observations, under the guidance of his friend and correspondent Mr. Hanbury, cannot fail to supply us with much knowledge of the vegetation of South Brazil which can only be given by a resident botanist.

### United States of North America.

The progress of biological investigation in the United States, at least as far as Scientific Bodies have contributed to it, having been the subject of my last year's Address, I need say but very few words on the present occasion. I have, however, to express my regret at one accidental omission, that of the Essex Institute at Salem, whose Proceedings, now forming five 8vo volumes, are replete with zoological and botanical papers of general as well as of local interest. Amongst those contained in the most recent numbers, I observe the commencement of a Flora of the Hawaiian Islands by Mr. Horace Mann, which appears to be drawn up very nearly upon the plan sanctioned by the late Sir William Hooker for the series of our Colonial Floras. Such a Flora is now much wanted to enable us to form a fair judgment of the peculiar vegetation of that group, comprising so much that is absolutely endemic, but partaking also of that South-Pacific flora which extends to the shores of Australia. I should also now mention, as not having come within the scope of my last year's review, the completion of Mr. Eyton's great work on the Comparative Osteology of Birds; the commencement of Mr. Elliott's 'Birds of North America,' a magnificent series of large folio plates, intended as a sort of supplement and companion to the great work of Audubon, and Professor Louis Agassiz's ichthyological and geological expedition to Brazil. In this journey, which appears to have been well planned and eminently successful, he was accompanied by a staff of six assistants (including a skilled draughtsman) whose expenses were defrayed by Mr. Nathaniel Thayer, by six volunteer assistants, by a doctor and his wife, and, last but not least, by his own wife, Mrs. Agassiz, to whose pen we are indebted for a most interesting as well as instructive narrative of the expedition. The scientific results have not yet been published, but I shall presently

have occasion to allude to such mention of them as I find in these pages.

### Britain.

The unparalleled success of our Zoological Society under the active and able management of their present Secretary, the efficient and, I trust, ever-increasing support that our own Society has met with of late years, the Societies established for the promotion of Entomology and other branches of our Science, and the number of Scientific and other Institutions in Edinburgh and Dublin, as well as in various provincial towns which more or less cultivate or encourage Natural Science, have given an impulse to its study which leaves us by no means behind any continental state in the number and importance of our biological publications, nor yet in the excellence of some of our illustrations, although in other cases, owing in a great measure to the high remuneration necessary to secure anything like high art, we may miss that neatness of execution which gives to some of the German and French biological plates such clearness and precision of detail in a small compass. I trust, however, that we are now giving up those exaggerated analyses upon too gigantic a scale to be readily caught by the eye, which were prevalent some ten or twenty years back, without recurring to the small uninstructive ones of former days; and some of the most recent zoological illustrations may really be cited as models of art.

It would be useless on the present occasion to do more than mention by name the principal works and papers on systematic and structural Zoology which have appeared in this country within the last two years. Such are:—Mr. W. K. Parker's Treatise on the Shoulder-girdle and Sternum in the Vertebrata, and his Memoir in the Philosophical Transactions on the Structure and Development of the Skull in the Ostrich Tribe; Mr. St. G. Mivart's paper in our Transactions on the Anatomy of *Echidna Hystrix*; Professor Owen's Memoir on the Skeletal Characters of the Dodo; Professor Huxley's New System of Classification of Birds, proposed in the Proceedings of the Zoological Society; Dr. J. E. Gray's Synopses of various Families, in the same Proceedings, and in the Annals of Natural History, especially Bats, Squirrels, and Eared Seals; the sixth and seventh volumes of Dr. Günther's Catalogue of Fishes, bringing the classification down to the end of the order Physostomi, and the splendid work which the same distinguished ichthyologist has brought out, in conjunction with Col. Playfair, under the auspices of the Bombay

Government, on the Fishes of Zanzibar; the Monograph Mr. J. C. Cox has commenced of the Land-shells of Australia; Mr. Gwyn Jeffreys's British Conchology, of which four volumes have appeared; a continuation, at somewhat irregular intervals, of Messrs. Spence Bate and Westwood's British Sessile-eyed Crustacea; Mr. G. S. Brady's paper on Marine Ostracoda, now printing for our Transactions; Miss Stanley's little Popular History of British Spiders; Sir John Lubbock's papers on *Thysanura*, on *Chloëon*, and on *Pauropus* in our Transactions; Dr. Baird's papers on animals of the lower orders in our Journal; and very numerous entomological papers, which I leave more especially to the Entomological Society to review and discuss.

Mr. Gould's great illustrated work on the Birds of Asia has reached its 20th part; twelve parts are now published of his 'Birds of Great Britain;' and a fourth supplemental part of his 'Birds of Australia' has very recently appeared. Messrs. Sclater and Salvin have commenced, under the title of 'Exotic Ornithology,' an important work intended as a sort of continuation of the 'Planches Coloriées' and of the 'Iconographie Ornithologique' of Temminck, comprising detailed descriptions and figures of new or imperfectly known exotic birds, accompanied by synopses of species of the genera to which they respectively belong. The five parts published relate exclusively to Tropical American Birds. Of the late Mr. Reeve's 'Conchologia Iconica,' fifteen parts have appeared since the beginning of 1866; Mr. Hewitson continues his beautifully illustrated works on Exotic Butterflies; Mr. Stainton has completed the first series of ten volumes of his 'Natural History of Tineina.'

I copy from Mr. Dallas's notes the following observations, as I have not had time myself to look into either of the works mentioned:—"Mr. Wollaston has followed up his valuable investigations of the Coleoptera of the Madeira and Canary islands with an examination of those of the Cape Verde Islands, the result of which he has published under the title of 'Coleoptera Hesperidum.' From this work we find that the coleopterous fauna of these distant islands presents a most marked resemblance to that of the more northern groups, which had previously engaged Mr. Wollaston's attention. Notwithstanding their much more southern position, there is but little to indicate a more tropical or African character about them; so that, at least as far as Coleoptera are concerned, Mr. Wollaston thinks that all these Atlantic islands may be regarded as belonging to a single fauna. In the Cape Verdes, again, as in the Canaries and

Madeira, we find a multitude of forms described as species, but differing from each other, or from known species living in other localities, by such minute characters that, but for their permanence and geographical localization, they would be regarded as mere varieties. For these forms Mr. Wollaston seems inclined to adopt a sort of semi-Darwinism; that is to say, he admits that they may have been produced by modification consequent on the breaking-up of the district into islands; but at the same time implies that, could this be demonstrated, we should have to suppress the species."

"The second volume of Dr. Bowerbank's 'Monograph of British Spongiadæ' appeared in 1866. This work has called forth a host of comments, in which the views of the author upon physiological and classificational questions have been rather roughly handled. We may call particular attention to a valuable paper by Prof. James-Clark, read to the Boston Society of Natural History, and reprinted in the 'Annals of Natural History,' on the relationship of the ciliated sponges to the Flagellate Infusoria, which bids fair to throw some light upon the intricate affinities of the Protozoa. Professor Oscar Schmidt, in a second supplement to his 'Sponges of the Adriatic,' has also entered into a discussion of Dr. Bowerbank's genera."

Mr. Murray's elaborate work on the Geographical Distribution of Mammals, the greater part of it devoted to the discussion of the distribution of the subordinate groups of the Mammalia, is carried out into considerable detail, and furnishes an excellent guide to this important subject. The numerous maps with which it is illustrated, upon the plan of those adopted in the Kew Museum in respect of economical plants, are excellent, as exhibiting at one view, for purposes of comparison, the general areas over which the several groups extend. Upon looking over them, without having studied the text, I have been struck with the little correspondence shown in their areas with what is known of the geographical distribution of large and widespread genera of plants. The preliminary inquiries show a high appreciation of, though not, in all respects, a concurrence with, the views of Mr. Darwin. Mr. Murray, like many of us, has found reason to alter, in some respects, his former views as to the stability of species; he now admits their derivative origin and occasional modification; what he still contends for appears to be that the changes are sudden and directly consequent upon absolute change of condition, and never gradual and continuous, nor dependent on selection in the struggle for life. He refers to views expressed in some of Sir Charles

Lyell's former works, which have, I believe, since been modified, and quotes also an expression of my own, that "Every species has certain determinate limits of variation, which it only exceeds under exceptional circumstances; and the exceptionally abnormal forms thus produced are few in individuals, and are not reproduced." This was penned before the publication of the 'Origin of Species.' Had I now to repeat the formula, I should omit all absolute expressions, and admit of the occasional permanence of their transgression, when the changes are not checked by cross breeding and other causes detailed in Darwin's more recent work. I have also little doubt that a careful study of this book must have on Mr. Murray's mind some of the effect it has had upon mine; and even at present his hypothesis as to the cause of restricted areas (p. 10) appears to me not to differ essentially from natural selection in the struggle for life.

I take this opportunity of adverting to the 'Journal of Travel and Natural History' lately commenced by Mr. Murray, which promises to supply a deficiency much felt in the science. The three numbers already out afford a promise that it will be found well to repay any encouragement given to it on the part of naturalists.

In Systematic Botany, Dr. Hooker and myself have completed the first volume of our 'Genera Plantarum.' Colonel (now General) Munro has inserted in our Transactions a most valuable monograph of that very difficult but important group of grasses, the Bambusaceæ. Their gigantic size, the rarity with which many of them flower, are the chief causes of the very unsatisfactory state of our herbarium specimens; but, besides a close study of Gramineæ during many years, General Munro has been able to observe many of them living in the various countries to which his military duties had called him, and thus very materially to advance our knowledge of them. Our Journal contains also a continuation of Dr. Masters's excellent monograph of Restiaceæ, an order the study of which is much complicated by the great dissimilarity frequently observable between the individuals of the two sexes. In some, indeed, of the best general systematic works, he found the males and the females of the same species placed in different genera. The 'Synopsis Filicum,' which had been brought by the late Sir William Hooker into a very advanced state, has now been published under the editorship of Mr. J. B. Baker—who has supplemented it by a paper on the geographical distribution of Ferns, in our Transactions.

Dr. Hooker has undertaken the continuation of his late father's 'Icones Plantarum,' the second part of the new series being on the

eve of publication; the plants figured are selected from those of the Kew Herbarium which appeared the best for illustrating new or interesting generic or sectional forms, or comparatively little-known floras. Mr. Wilson Saunders has commenced a somewhat similar, but partially coloured work, entitled 'Refugium Botanicum,' containing figures of the most curious species that flower in his rich and varied collection at Reigate. Mr. Hardwicke's new and methodically arranged edition of 'English Botany' has now nearly completed its eighth volume.

The plates for Dr. Welwitsch's "Sertum Angolense," to appear in our Transactions, are all engraved, and we are in great hopes of very soon being able to place the text in the printer's hands. In the meantime he has published in our Transactions, in conjunction with Mr. Currey, the Fungi collected in his Angola expedition; and his terrestrial and freshwater Mollusca have been published by M. A. Morelet at Paris, together with a general introductory sketch of his arduous and most successful journey.

I am obliged, with regard to Britain as to other countries, to pass over the numerous contributions to Botany which have appeared in the shape of detached papers in our Transactions and Journals, in the Transactions of the Botanical Society of Edinburgh, and of various provincial societies, in Seemann's Journal of Botany and the Annals of Natural History, besides local Floras, and other works of local botanical interest.

In general Biology a great advance has been made by the publication of the first portion of that wonderful series of observations, collection and verification of recorded facts, and methodical studies upon which Mr. Darwin has founded his theories on the modification of species through successive ages. In one of the first notices of this "Variation of Animals and Plants under Domestication," in a journal of literature and science of large circulation, I was not a little surprised to find the assertion that these volumes "contain nothing more in support of the hypothesis of origin by selection than a more detailed reasseveration of the guesses founded upon the so-called variations of pigeons." The most charitable interpretation to be put upon this sentence is, that the critic had reviewed the book from preconceived notions without reading it; and this sweeping condemnation might have been passed over in silence; but as the same journal, and possibly the same critic, asserts, in another number, that natural selection is rapidly declining in scientific favour, and as similar vague denunciations and sneers at Darwinism find

their way into public addresses and works in which science is diluted for popular use, even by Fellows of our society, I may perhaps be allowed a few observations on what appears to me to be the present state of the questions he has propounded, and how far their solution has been promoted by his present work.

It is nearly ten years since the first sketch of his now celebrated theory of Natural Selection was laid before this society, followed early in 1859 by the publication of his 'Origin of Species;' it is this day five years that, on the occasion of calling your attention to the reception which his views had met with from the scientific world, I observed that the tide of opinion among philosophical naturalists appeared to be fast setting in favour of the hypotheses he advanced. From such a review as I have been able to make of the current biological literature, it appears to me that the current has continued to flow in the same direction. There is scarcely a work or a paper on general biological subjects in which Darwinism is not more or less discussed, the name being adopted (at least in America and Germany) as no longer conveying a sneer. Eminent naturalists, who were still reluctant to abandon long-cherished theories, and hesitated to declare themselves openly, have now boldly adopted Darwinian views; from Sir Charles Lyell, who had formerly relied on the multiple fixity of species, we have, in the recent tenth edition of his 'Principles of Geology,' a most admirable summary of the theory of derivative origin and of its bearing on the geological history of the globe; profound thinkers, especially in Germany and in this country, have argued upon some of the principal points as established facts; essays have appeared in various parts of the Continent with a view to popularize more or less of the principles laid down; and even the constant repetition of vague party declamations against the system are evidences of the ever firmer hold it is taking upon the minds of the naturalists to whom, or at whom, these denunciations are addressed. The strongest opposition now kept up amongst observing naturalists is, perhaps, that of the party in France who still maintain the cause of spontaneous generation with all the bitterness of a social dispute. Of a very different character is Professor Agassiz's maintenance of the immutability of species; for although, on starting for the Brazilian expedition above alluded to, he avers that the conviction which drew him irresistibly into it was that the combination of animals on that continent, where the faunæ are so characteristic and so distinct from all others, would give him the means of showing that the transmutation theory was

wholly without foundation in facts, yet he indulges in no sweeping denunciations, but treats the question as the most important subject of investigation. One of the instructional lectures given on the voyage out to his young companions contains the following excellent passage:—"There is a change to be introduced into our mode of work as compared with that of former investigators. When less was known of animals and plants, the discovery of new species was the great object. This has been carried too far, and is now almost the lowest kind of scientific work. The discovery of a new species, as such, does not change a feature in the science of natural history any more than the discovery of a new asteroid changes the character of the problems to be investigated by astronomers. It is merely adding to the enumeration of objects. We should look rather for the fundamental relations among animals; the number of species we may find is of importance only so far as they explain the distribution and limitation of different genera and families, their relations to each other and to the physical conditions in which they live. Out of such investigations there looms up a deeper question for scientific men, the solution of which is to be the most important result of their work in the coming generation. The origin of life is the great question of the day. How did the organic world come to be as it is? It must be our aim to throw some light on this subject by our present journey." How far the facts collected by the Professor in this journey answered his hopes of a triumphant refutation of Darwinism does not appear in the narrative. The principal general results mentioned as connected with biology are:—the evidences of a long-continued glacial period preceding the establishment of the present races of Brazilian animals and plants; the number of genera and species of fishes, so enormously exceeding all previous expectations; the extremely limited areas the majority of them occupy, without the appearance of any physical conditions limiting those areas; the absence of genera belonging to temperate regions compensated by representative genera; the conviction that the physiological and other differences between the different races of men are as great as those which separate distinct species of animals; and a general conclusion that among plants as among animals, at least in some instances, there is a correspondence between the youngest stages of growth in the higher species of a given type and the earliest introduction of that type on earth.

In the meantime, observations bearing upon the life of species have been multiplied in many darts of the world. When Mr.

Darwin published his volume on the fertilization of Orchids, and his papers on dimorphic and trimorphic plants in our journal, a regret was expressed that he was delaying the completion of his great work by investigations not directly connected with it; but now that a portion of that great work has at length appeared, it becomes clear what important clues these phenomena afford to the solution of various obscure points in the history of races; and the great prevalence of dichogamy and dimorphism is now fully confirmed by numerous observers whom Darwin's works have called forth. These and other observations in confirmation of, or in apparent contradiction to his own, have been so well collected and discussed by Mr. Darwin himself that I need not further dwell upon them, but shall proceed in the attempt to point out shortly what the present work on the Variation of Animals and Plants under Domestication has effected towards the proof and advancement of the general question.

The first great fact to establish as the main foundation of the whole fabric was the extent of variability in animals and plants—that is, that the offspring are liable to differ from the parent in any and every character, even in those which are usually reckoned of generic importance, and the transmissibility of these variations to subsequent generations; and the greater part of the first volume is devoted to the exposition and discussion of the evidences in support of these propositions, going through the whole range of domesticated animals and plants. The summaries of these chapters, excellent as they are, give but a very inadequate idea of the richness of their contents. Duly to appreciate the authority and bearing of the numerous and varied facts here collected and methodized, every word must be read and every page must be studied; for Mr. Darwin never indulges in the empty verbiage so characteristic of certain French and Italian writers on general biology, nor yet in the dogmatism of the Germans. And this portion of his work being essentially a collection of evidences, he refrains from all figurative illustrations. The only metaphor, indeed, which I have observed in the two volumes is that of the selection by the architect of the fragments of the fallen rock suited to his purpose, in illustration of selection by man of variations applicable to uses for which they were not intentionally produced; and even this metaphor, appropriate as it may be, had better, perhaps, have been dispensed with; for the comparison of objects which are not *pari genere* is very liable to be carried out beyond the limits of strict analogy, and then to mislead rather than elucidate.

For the fullest details, pigeons, rabbits, horses, fowls, culinary plants, and fruits are selected, as affording at once the best evidence of community of origin and the most striking instances of diversity in form and structure in the domesticated races; but the chapters on dogs, pigs, cattle, ducks, and miscellaneous plants are equally instructive. In these same chapters the effects of selection by man, methodical or unconscious, are throughout kept in view and discussed in relation to every class of animals or plants treated of. Throughout it appears that the comparative amount of variation obtained under the care of man in the several organs has depended, not on any innate comparative variability of the organs, but on the objects sought to be attained.

The eleventh chapter is devoted to the very curious and comparatively novel subject of bud-variation, in relation to which very few facts have as yet been observed; but some of these, like that of the *Cytisus Adami*, have been so startling as to have been denied in part or *in toto*. Such as can be well authenticated are here subjected to a most interesting discussion. They seem to bear little upon the general question of origin by selection, but much more upon the hypothesis brought forward in the second volume, to which I shall presently allude.

In the second volume I was much struck with the admirable chapters on crossing (XV. to XIX.), as deserving of special study. A methodical review of the present state of our knowledge of a subject which has been so much advanced by experiments and observations provoked by Mr. Darwin's first work, is accompanied by the exposition of the various effects of the complicated phenomena of crossing and interbreeding in provoking variation or in maintaining the stability of species, in improving or deteriorating races, according to conditions more or less known to us.

Two chapters are devoted to a general review of methodical or unconscious selection by man as well as of natural selection on domesticated species, as deducible from the facts detailed in the first volume, accompanied by historical sketches of changes known to have been effected by these means.

The fact of variability being established, an investigation into the very obscure subject of the causes of variability, and the endeavour to trace out the laws of variation, necessarily followed. Few and vague as are the data from which we can judge of those causes, such as Mr. Darwin has been able to collect lead him to conclude that the variability of organic beings under domestication results from

the conditions to which the parents have been exposed, but that the amount and direction of variation by no means correspond with the amount and nature of the changed conditions, but is regulated by a variety of laws, of many of which very little is as yet known, but of which some of those which are best evidenced are here brought forward. The subject must necessarily be still further investigated when variability of organic beings in a state of nature comes to be considered in detail.

A much more difficult subject than any others treated of in these volumes is the proposed new hypothesis of Pangenesis; but as this question is of a somewhat speculative nature, I shall not presume to offer you more than a few words of notice on the present occasion. Certain facts in the history of organisms, in their reproduction, variability, inheritance, and reversion to long-lost characters, although well authenticated, appeared quite anomalous and inexplicable under the general laws of succession hitherto propounded. These facts Mr. Darwin has endeavoured to connect by the supposition that the cells or units composing the living body, besides the admitted propagation by self-division or prolification, throw off during all stages of development minute granules or atoms which he calls gemmules which circulate freely throughout the system, and when supplied with proper nutriment—when united with other partially developed cells or gemmules—become developed into cells like those from which they are derived,—that they are transmitted from the parent to the offspring, and are usually developed in the generation which immediately succeeds, but may be transmitted in a dormant state through many generations, and then developed. This hypothesis startles us at the outset, as entailing the supposition of an infinitesimal minuteness, number, and complexity beyond all powers of conception; and a first glance over the chapter seems to show but very few facts upon which to found what Mr. Darwin himself characterizes as a gratuitous assumption. But if, on a second reading, we take into consideration how familiar mathematical signs make us with numbers and combinations, the actual realization of which is beyond all human capacity, how inconceivably minute must be the atoms even of those emanations which most powerfully affect our sense of smell or our constitutions; and if, discarding all preventions, we follow Mr. Darwin, step by step, in applying his suppositions to the facts laid before us, we must, I think, admit with him that they may explain some, and are not incompatible with others; and it appears to me, from the very few critical observations I have as yet met with, that

they will be admitted by many as a provisional hypothesis, to be further tested, and to be discarded only when a more plausible one shall be brought forward.

In conclusion, I cannot but express my belief that it will be generally admitted that Mr. Darwin has in this work most satisfactorily laid before us the first important instalment of that great repertory of facts from which his celebrated theory has been deduced; and we can only look forward with the greater eagerness to the appearance of that second portion (the variation of animals and plants in a state of nature) the data of which are so numerous, and so varied in their authenticity as well as in their signification, as to require all Mr. Darwin's skill to test them, to methodize them, and to apply them so as to enable us correctly to judge of the strength of his conclusions. In the meantime, it is to be hoped that the spirit of observation which his works have already called forth will be carried out in the same direction by lovers of our science in all parts of the world. Naturalists residing in countries where no new forms are to be discovered, need not think that there is nothing for them to do towards the advancement of biological science; nor need they be reduced to cataloguing individual or fleeting varieties in the form of a leaf, or the hairs of its surface. Tracing out the history of a plant or an insect from the first development of the egg to the final extinction of its life, of the changes it undergoes in its internal organization, of the vicissitudes of its life from external causes, local, climatological, or social, of its relation to the surrounding organisms, of the degree in which it is prejudicially or beneficially affected by living beings of its own or of any other class, are now subjects of inquiry much more important than differences in external form. But in every biological undertaking, whether it be the monograph of a group or the Fauna or Flora of a country, the exposition of a physiological structure or of a phenomenon of life, the enunciation of a new theory or the refutation of an old one, the periodical surveys I have had to take of biological works have convinced me that there is one true course to pursue:—first, to observe for one's self once and again, and to test personally the observations of others; secondly, to collect, compare, and methodize all that has been published and authenticated upon the group, the district, the organ, the phenomenon, or the theory which is the subject of investigation; and, thirdly, and only after the first two processes have been exhaustively carried out, to reduce the observations to a general treatise, and speculate upon the conclusions to be drawn from them. And in this

course it appears to me that no better model can be chosen than Charles Darwin's 'Variation of Animals and Plants under Domestication.'

## OBITUARY NOTICES.

The Secretary then read the following notices of deceased *Members*.

*The Rev. Hamlet Clark, M.A.*, was born at Navenby, in Lincolnshire, on the 30th of March 1823, and died at Rhyl, in North Wales, on the 10th of last June. I have been favoured with the following brief notice of Mr. Clark from his friend the Rev. G. B. Blenkin, who says that "my remembrance of Hamlet Clark extends back to 1833, when we were schoolfellows at Beverley Grammar School. He was always a straightforward and truthful fellow, one for whom a good deal of boyish sympathy was felt; for at that time his health was not strong, a circumstance which often prevented his joining in the sports of his schoolfellows.

On leaving Beverley, he went to read with the Rev. Mr. Scott at Wappenham, where the love of insects appears to have been awakened in him by some of his fellow-pupils.

At Cambridge he soon became one of the most popular among the undergraduates. Tall and handsome, and with a free open countenance and frank and generous spirit, he soon won for himself a reputation in College, and exercised a considerable influence for good, more especially among the non-reading men.

He was a most diligent and laborious worker and reader on subjects of natural history, and especially entomology; and, had the same facilities existed at Cambridge then as now for acquiring that kind of knowledge, there can be no doubt he would have held a very high place in the opinion of the University, and obtained a very high degree in the Tripos. As it was, he was constantly reading books on the subject, and consorted with others like-minded with himself, such as Wollaston, of Jesus, and Babington, of St. John's, his rooms being piled up with cases for insects.

On Saturday mornings (the Cambridge market-day) he used to have a perfect bevy of callers from the country, bringing insects for purchase, or other strange creatures they may have