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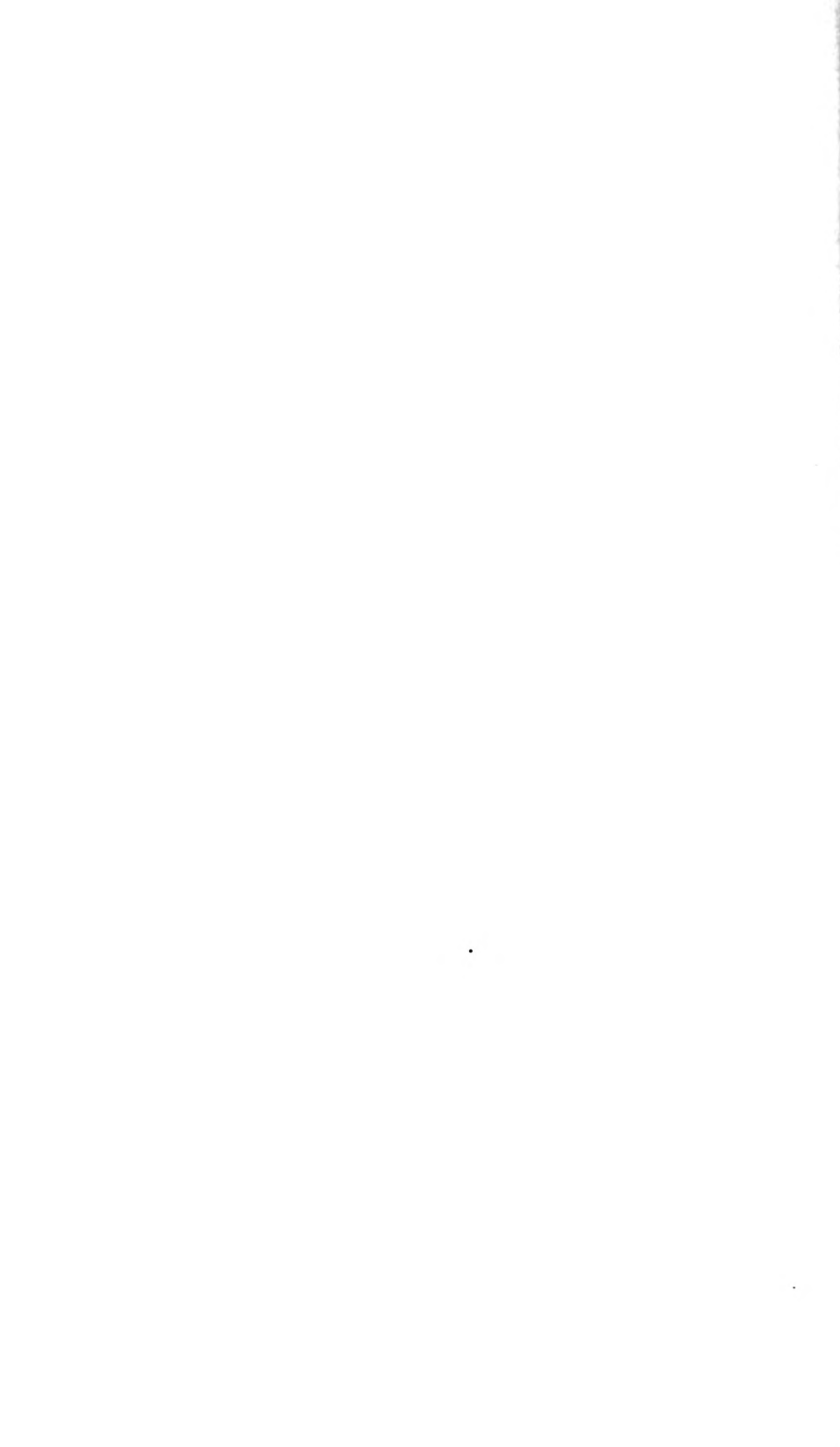
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PROCEEDINGS

OF THE

LINNEAN SOCIETY OF LONDON.



132ND SESSION.

FROM NOVEMBER 1919 TO JUNE 1920.

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### SUPPLEMENT.

Commemoration of Sir Joseph Banks, Bart., F.R.S.

## PUBLICATIONS: SESSION JULY 1919-JULY 1920.

## Journal, Botany.

Vol. XLIV.	No. 300.	10/-
„ XLV.	„ 301.	20/-

## Journal, Zoology.

Vol. XXXIV.	No. 227.	14/-
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Proceedings, 131st Session, October 1919. 6/-

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List of [Fellows, Associates, and Foreign Members], Nov. 1919.

# PROCEEDINGS

OF THE

## LINNEAN SOCIETY OF LONDON.

(ONE HUNDRED AND THIRTY-SECOND SESSION,  
1919-1920.)

November 6th, 1919.

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 19th June, 1919, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Miss Florence Annie Mockeridge, D.Sc., was admitted a Fellow.

Certificates in favour of the following were read for the second time:—Mr. Arthur Robert Thompson, Lieut. R.A.F., Miss Mary Ross Hall Thomson, Mr. Humphrey John Denham, B.A.(Oxon.), Mr. Ethelbert Ambrook Southee, Mr. Benaiah Colson Adkin, M.A.(Cantab.), George Parker Bidder, M.A., Sc.D.(Cantab.), Miss Vera Adelaide Irwin Smith, B.Sc.(Sydney), Mr. James Robert Matthews, and Miss Beatrice Buckland Taylor.

The following were proposed as Fellows:—Mr. Narayanan Padmanabha Panikkar, B.A.(Madr.), James Davidson, D.Sc.(Liverp.), F.E.S., Mr. Sahay Ram Bose, M.A.(Calc.), Mr. Tribhawan Nath Bhan, Thomas Robertson Sim, Hon. D.Sc.(Pretoria), Mr. Frank Henry Taylor, F.E.S., William Rushton Parker, M.A., M.D.(Cantab.), Mr. Jacques de Vilmorin, Mr. Arthur

Lionel Goodday, Lieut. R.G.A., Geoffrey Douglas Hale Carpenter, M.B.E., B.A., D.M.(Oxon.), Mr. Arthur Stanley Hirst, Mr. William Grant Craib, M.A.(Aberd.), Mr. Sydney Percy-Lancaster, and Mr. Herbert William Pugsley, B.A.(Lond.).

The President read the following proposed alterations in the Bye-Laws, for the first time:—

In Chapter II, Sections 2, 3: "That the privilege of Compounding for the Annual Contribution be suspended."

In Chapter XV, Section 3, to leave out the words: "Five years shall have elapsed from." [The whole section stands thus, the words proposed to be left out being in italics:—

"No Fellow of the Society shall be entitled to receive, gratis, any copy of the 'Transactions,' or other serial Publications, after *Five years shall have elapsed from* the Time of their Publication, unless the Council shall otherwise direct."]

The first paper, by Colonel H. E. RAWSON, C.B., F.L.S., "Plant-sports produced at will," was illustrated by the Episcopo.

Prof. J. B. Farmer and Dr. R. R. Gates discussed the paper, and the Author replied. (See Abstract, p. 64.)

The second paper was by Mr. LANCELOT HOGGEX, B.A., B.Sc., and entitled "Nuclear Phenomena in the Oocytes of *Neuroterus*, a Gall-fly," which was communicated by Dr. Eric Drabble, F.L.S.

Dr. R. R. Gates added a few remarks on the paper.

The last paper, "A Revision of the genus *Baphia*, Afzel.," by Mr. L. V. LESTER-GARLAND, M.A., F.L.S., was summarized by the Author.

Mr. E. G. Baker commented on the geographical distribution of the species.

November 20th, 1919.

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 6th November, 1919, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Mr. Robert Selby Hole, Mr. Alfred William Sheppard, Mr. Humphrey Godwin Billinghamurst, and Prof. Robert Colquhoun McLean, M.A., D.Sc., were admitted Fellows.

Mr. Joseph Omer-Cooper and Miss Lucy Ellen Cox were proposed as Fellows.

The Certificate in favour of Mr. Narayanan Padmanabha Panikkar, B.A., was read for the second time.

Mr. Arthur Robert Thompson, Lieut. R.A.F., Miss Mary Ross Hall Thomson, Mr. Humphrey John Deuham, B.A. (Oxon.), Mr. Ethelbert Ambrook Southee, Mr. Benaiah Colson Adkin, M.A. (Cantab.), George Parker Bidder, M.A., Sc.D. (Cantab.), Miss Vera Adelaide Irwin-Smith, B.Sc. (Sydney), Mr. James Robert Matthews, M.A. (Edin.), and Miss Beatrice Buckland Taylor were elected Fellows.

The proposed alterations in Chapters II. & XV. of the Bye-Laws were read from the Chair for the second time.

Mr. T. KERR PATTON exhibited 34 plants from Mesopotamia and 78 from Southern India, collected whilst on service, and mounted on post-cards. He spoke of the soil in Mesopotamia being easily dug with the spade to a depth of thirty feet, and the rapid growth of crops after being sown.

Mr. L. V. Lester-Garland and Mr. C. C. Lacaita contributed further remarks, and Mr. Patton replied.

Mr. C. C. LACAITA showed specimens of *Orchis maculata* collected on Monte Gargano, Italy. Dr. G. C. Druce made some observations, to which Mr. C. C. Lacaita replied.

Dr. G. CLARIDGE DRUCE exhibited specimens and read the following account:—

“On the Occurrence in Britain as Native Plants of *Ajuga genevensis* and *Centaureium scilloides*, Druce, var. *portense* (Brot.)”

Although there are previous records of *Ajuga genevensis* from Britain the records are probably mistakes for *pyramidalis* or other species, and in one instance due to a garden-escape of the true plant; this discovery of *genevensis* on the Berkshire downs is an undoubted evidence of it as a British species. It was discovered by Miss Fry in May 1918, and the exhibitor went with her in the next week to examine the habitat. Here there seems little likelihood of accidental introduction. The plant grows on the grassy chalk-downs near furze-bushes, but is limited to a small area.

*Centaureium scilloides* is the *Erythraea diffusa* of Joseph Woods, who discovered it near Morlaix in Brittany. As a somewhat different form it had been previously discovered by Masson in the Azores, where it is said to be always a white-flowered form. The younger Linnæus (Suppl. 175, 1781) described the latter as *Gentiane scilloides* with yellow flowers, a mistake which misled botanists to

think it was a form of the yellow-flowered *maritimum*. Brotero (Fl. Lusit. i. 278, 1804) gave to the mainland form the name of *Gentiana portensis*, so called from Oporto, near which place it occurs.

Since our plant is the pink-flowered plant of the mainland it has been named as above, Brotero's being the earliest trivial name. The plant was sent me in September 1918, when I was away from home, by Mr. Arnett of Tenby. This year I went to visit the locality where the friend of Mr. Arnett discovered it, and was informed it was limited to a piece of ground about two yards square, on a headland near Newport, Pembroke. However, I was glad to see it growing on the edge of a grassy cliff over some considerable area in addition to the small patch first discovered. There it seems undisputably native. The bay beneath is open to gales which I was told bring in some considerable quantity of wreckage, but the plant grows with other native species above the reach of ordinary driftage. The question arises, can the small seeds of plants be conveyed in sea-spume, and may this be the cause of the occurrence of *Frukenia* and *Limonium bychaidifolium* on the Jersey cliffs, and incidentally the cause of other members than this interesting *Centaurium*, of the so-called Atlantic species, being introduced in remote times into the British Isles. The record and description of the Pembroke plant as *Erythra scilloides* was made by Mr. A. J. Wilmott in Journ. Bot. li. 1918, p. 321. As in the case of the *Ajuga*, there is a previous record of this *Centaurium* as a British plant, and that on the high authority of Nyman (Consp. 502). But Nyman blindly followed Grisebach (DC. Prod. ix. p. 59), who simply mis-read "Pr. Morlaix Britt., Woods," to mean Britannia instead of Brittany, where Morlaix is situated and where Joseph Woods found it.

Mr. A. J. Wilmott, Mr. C. E. Salmon, and Mr. E. G. Baker discussed various points, Dr. Druce replying.

[Note received 24th November, 1919.—Specimens in the herbaria of Buddle and of Petiver in the British Museum (Natural History) and of Stonestreet, at Oxford, are not contemporaneous with Thomas Johnson, but probably were collected fifty years later.]

Dr. DRUCE also showed a few highly finished water-colour drawings of British *Rubi* by Miss TROWER.

The last communication was by Prof. R. C. McLEAN, entitled "Sex and Soma," of which the following is an abstract:—

The Author enlarged upon the recently discovered phase of multinucleosis in the developing soma cell of higher plants. The genetic interest of the phenomenon has not received sufficient consideration, and the present paper was designed to direct attention to the possibilities involved. The Author maintained, in opposition to Arber and Beer, that there is evidence of nuclear

reunions taking place in the multinuclear cells, and he characterized these fusions as modified sexual conjugations consequent upon the long series of vegetable divisions in the lineage of a soma cell, and necessary to avoid the degeneration which experiment shows to be attendant upon prolonged vegetative propagation. The development of the plant body may thus be regarded as embracing two phases of stimulus: first, the normal sex stimulus which initiates the period of maximum cell proliferation, and, secondly, this somatic nuclear union, initiating the period of maximum differentiation. Tissue differentiation, it was suggested, may be associated with some process of segregation subsequent to this nuclear fusion. The separation of sex characters in the development of monoecious organisms was pointed to as evidence of the existence of such segregation during development.

It was finally suggested that germinal modifications as well as somatic segregations may be derived from a mechanism of nuclear fractionization and subsequent partial reunion in somatic cells.

December 11th, 1919.

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 20th November, 1919, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered, a special vote being accorded to Mr. HUGH FINDON, F.L.S., for his gift of Kirkman's 'British Bird Book.'

Dr. George Parker Bidder, M.A.(Cantab.), Mr. Arthur Robert Thompson, Lieut. R.A.F., Mr. Stuart Hogg, and Mr. Benaiah Colson Adkin, M.A.(Cantab.), were admitted Fellows.

The following were proposed as Fellows:—Dr. George Kenneth Sutherland, M.A.(Aberd.), Mr. Harry Bertram Harding, Mrs. Elinore Egerton Harde, George Albert Boulenger, LL.D., D.Sc., F.R.S., and Mr. Edmund Gustavus Bloomfield Meade-Waldo.

The Certificate in favour of Dr. James Davidson was read for the second time.

Mr. Narayanan Padmanabha Panikkar, B.A., was elected a Fellow.

The proposed alterations in the Bye-Laws, which had been read from the Chair on the 6th and 20th November, were submitted to the Ballot and carried.

Prof. W. A. HERDMAN, For.Sec.R.S., F.L.S., read his paper entitled "Notes on the abundance of Marine Animals and a quantitative survey of their occurrence," which was illustrated by lantern-slides.

Prof. Dendy and Sir H. H. Howorth, K.C.I.E. (visitor), contributed further observations, and the Author replied.

Mr. J. BRONTÉ GATENBY, B.A.(Cantab.), B.Sc., read his paper, "The Germ-cells and early Development of *Grantia compressa*," which was communicated by Mr. E. S. Goodrich, F.R.S., Zoological Secretary.

Prof. Dendy reviewed his earlier observations on this sponge, and congratulated Mr. Gatenby on his good fortune in securing individuals in a condition to afford such good results—a somewhat rare condition. Dr. G. P. Bidder continued the discussion by adverting to his own observations and deductions from the appearances presented to his view. Mr. Gatenby replied. Many lantern-slides were employed by all these speakers in elucidation of their remarks.

January 15th, 1920.

DR. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 11th December, 1919, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered, a special vote being accorded to the Institute of Preventive Medicine for its gift of a large number of volumes on Sponges formerly the property of the late Prof. E. A. MINCHIN, F.R.S., Sec.L.S.

Mr. James Robert Matthews was admitted a Fellow.

The following were proposed as Fellows:—Mr. Pyari Mohan Debbarman, B.Sc., M.R.A.S., and Dr. Otto Vernon Darbishire.

The Certificates in favour of the following were read a second time:—Prof. Sabay Ram Bose, M.A. (Calcutta), Mr. Tribhawan Nath Bhan, Dr. Thomas Robertson Sim, Mr. Frank Henry Taylor, F.E.S., and William Rushton Parker, M.A., M.D. (Cantab.).



James Davidson, D.Sc. (Liverp.), F.E.S., was elected a Fellow.

The President spoke on the foundation of the "Goodenough Fund," and stated that a circular explanatory of its purpose would shortly be issued.

Dr. A. B. RENDLE, F.R.S., Sec.L.S., read an appeal for contributions in aid of a fund to purchase Monsieur Jules Cardot's Herbarium of Mosses for the Paris Museum of Natural History. He referred to Monsieur Cardot's misfortunes early in the war, and pointed out that the Herbarium is a valuable one, containing as it does the types of a large number of new species—those described by Cardot jointly with F. Renauld, a large number from India and tropical West Africa, the materials on which are based his 'Mousses de Madagascar,' 'Sphaignes d'Europe,' 'Recherches Anatomiques sur les Leucobryacées,' 'Monographie des Fontinalacées,' 'Diagnoses Préliminaires de Mousses Mexicaines,' etc.

The General Secretary gave a lantern lecture entitled "Methods of Botanic Illustration during Four Centuries"; of which the following is an abstract:—

The Lecturer explained his meaning with regard to the word "Illustration," namely, a representation in printing-ink or some similar medium, capable of identic reproduction in considerable numbers, thus excluding all drawings which need hand-copying, and all purely photographic prints. Colour could hardly be touched upon, as it is not easy to display in the lantern. Thus defined, illustration may be held to consist of three main methods:—

- (1) When the design projects from the surface, and the ink is applied only to the elevations;
- (2) When the design is cut into the surface, and the ink remains only in the depressions;
- (3) When the surface is practically level, the design being reproduced by chemical action as in lithography.

1. Surface design. Wood engraving was the first method employed, the early forms being known as block-books, drawing and legend being printed from the same block. On the introduction of movable type the woodcuts were at first confined to the ornamental part, then to copying the pen-drawings found in some of the old Codices of Dioscorides and similar authors. These drawings were crude; a few are selected from the work entitled 'Herbarius' from the first word of the work; it was printed at Mainz in 1484. These beginnings did not long satisfy the people of the Renaissance; accordingly in 1530 a volume came out with representations of plants, by Otto Brunfels, a German schoolmaster. Recently Dr. A. H. Church has published a sympathetic account of this precursor of botanic illustration, commenting on

his fidelity of draughtsmanship even of defects of the specimens before him. In 1542 the splendid folio of Leonhard Fuchs appeared, with woodcuts which have been deservedly praised for their accuracy and style; he gave the portraits of his three helpers, two draughtsmen and the engraver, at the end of his book. Within the next generation we find Rembert Dodoens, Pierre Pena, with his colleague Mathias de l'Obel, followed by many workers, including Charles de l'Escluse, our own John Gerard, the Valgrisi (Venetian printers), Camerarius, Boeck, and John Parkinson, whose large blocks were cut "plank-wise"—that is, down the grain—generally of pear-wood, often supplemented by an under layer of deal. With the advent of Thomas Bewick (1753–1828) wood-engraving entered upon a new phase; this celebrated man employed the white line and the flat black in a most skilful manner. Japanese and French specimens show the latest state of what is almost a lost art.

2. Copper plates. Contemporary with the later herbalists, copper-plate etching made its appearance; the etching was simply printed, none of the usual finesse of the copper-plate printer being used. Colonna, Reneaulme, and Alpini may be instanced as having successfully employed etching, and much later, Dillenius. Dry-point, the use of a needle on the plate to produce a burr, was much employed by Dr. John Hill; this burr rapidly wore away, and accounts for the poor appearance of many of Hill's plates, for the plan of "steeling" is a comparatively recent invention.

Engraving by trained craftsmen followed the use of etching; beautiful work may be seen in Vaillant's folio on the plants growing about Paris, and after Ehret, in the 'Hortus Cliffortianus.' Sole's plates in his 'British Mints' display the most elaborate attempt to show texture and colour, in a black plate. Mezzotint to a small extent was tried by John Martyn.

The second period of copper-plate engraving was largely that of stippling, as used by Redouté, and in our own time by Borne and Thuret.

3. Lithography depends upon the mutual repulsion of oil and water; a drawing upon a certain kind of limestone, made with greasy ink or chalk, will repel water, and the latter when soaked into the stone will repel ink, printing being an alternation of inking and wetting the stone before applying the paper and subjecting it to pressure.

Écype, Nature-printing or Bradburytype, and Woodburytype were next considered, and then current processes were discussed.

Zinco, or line process blocks, depend upon the property of bichromate salts in conjunction with gelatine or albumen of causing the compound to become insoluble under the action of light. A negative of a drawing is placed upon a metal plate thus sensitised, and after exposure, the gelatine which has been exposed to light remains hard, but the protected gelatine is washed away. The spaces between the lines are etched away with weak acid,

broad spaces are mechanically "routed," and the plate is mounted on wood nearly type-high. This process is only suited to drawings in line or stipple.

Half-tone is a more delicate process, and can be employed in copying various degrees of shading. At the present time a screen of two sheets of ruled glass, crossed and cemented, is placed in the camera near the sensitive plate; this screen is ruled from about 70 lines to the inch, for newspaper work, to 200 for the highest kind of art paper. The crossing of the two series of lines produces a series of dots, white in the darks, black in the lights, acting as pin-hole lenses.

Photogravure was next described, but its place in botanic illustration is small, owing to its cost.

Collotype is printing from a gelatine film, giving beautiful and graduated results without any perceptible grain.

Specimens of the blocks and of plates resulting from the described processes were shown on the table.

The President having spoken, Mr. A. J. Wilmott referred to the stipple-process and the usage of W. Curtis in printing the outlines of his 'Flora Londinensis' in colour, thus aiding the after application of colour.

The Lecturer, in reply, regretted that the large amount of material which had to be compressed into one lecture instead of several, had caused many of his sections to be omitted; he then instanced Redouté's work in stipple, which was printed in the colours appropriate to each part of the plate, the print being finished by hand-colouring.

February 5th, 1920.

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 15th January, 1920, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Mr. Leonard John Sedgwick was admitted a Fellow.

The President announced the vacancies in the list of Foreign Members, caused by the deaths of Prof. William Gilson Farlow, Prof. Ernst Heinrich Philipp August Haeckel, Prof. Gustaf Magnus Retzius, Prof. Simon Schwendener, and Prof. Hermann von Vöchting.

Mr. William Rickatson Dykes, M.A.(Oxon.), L. ès L.(Paris), was proposed as a Fellow.

The following were elected Fellows :—Prof. Sahay Ram Bose, M.A.(Calcutta), Tribhawan Nath Bhau, Dr. Thomas Robertson Sim, Frank Henry Taylor, F.E.S., and William Rushton Parker, M.A., M.D.(Cantab.).

A paper entitled "On the Existence of Two Fundamentally Different Types of Characters in Organisms" was read by Dr. R. RUGGLES GATES, F.L.S., of which the following is an abstract :—

The experimentalist point of view regarding evolution, resulting from the work in mutation and Mendelism, is frankly antagonistic to the views of palæontologists, anatomists, and others who deal with orthogenesis and the inheritance of acquired characters. I wish to show that while these two factors bear entirely different relations to evolutionary changes, both are necessary to account for evolution as it has taken place.

The conclusion is reached that higher organisms exhibit two contrasted types of characters, which differ fundamentally (1) in their manner of origin, (2) in their relation to the structure of the organism, (3) in their relation to such phenomena as recapitulation, adaptation, and inheritance, (4) in their relation to geographic distribution.

To the first category belong cell-characters, which arise as mutations, are represented in every cell of the individual, and are usually inherited as distinct entities. Since they are borne in the nuclei, it is proposed to call them karyogenetic characters. To the second category belong organismal characters, which arise gradually through impact of the environment or through orthogenetic changes, may modify only localized portions of the life-cycle, and may not be incorporated in the germ-plasm from the first. They may imply an increase or, in the gametophytes of plants, a shortening in length of the life-cycle.

The development of organismal characters is to be explained in connection with the principle of recapitulation. Embryonic recapitulation has arisen in connection with the adaptation of the organism to a new set of conditions, and implies the inheritance of acquired characters. Orthogenetic recapitulation, as in the juvenal plumage of birds, implies a change which is germinal in origin but added terminally to the life-cycle.

The antithetic alternation of generations in plants, implying the gradual development of the sporophyte by its intercalation between two gametophyte generations, is the same process as the development of orthogenetic recapitulatory characters. The homologous alternation in certain Algæ has probably arisen through a sudden change which is essentially mutational.

The cell theory of mutations leads to the concept of the species

cell. But there are definite limitations to the cell theory of organic structure, as pointed out by Sedgwick, Whitman, and others. The facts of recapitulation also limit the cell theory, for recapitulatory characters arise as lengthenings or shortenings of the life-cycle, and not through chromatic alterations present in every nucleus.

The usual objections to the biogenetic law are based on (1) dissimilarities in related eggs and embryos, (2) the fact that specific characters often appear very early in the ontogeny. Both these situations are to be expected if mutations occur in organisms which show recapitulation. This affords a definite basis for contrasting (*a*) karyogenetic, nuclear, or mutational characters with (*b*) organismal, recapitulatory, or orthogenetic characters.

The President having opened the discussion, the following speakers engaged in it:—Dr. J. R. Leeson, Prof. E. S. Goodrich, F.R.S., Dr. W. Bateson, F.R.S., Dr. F. A. Bather, F.R.S. (visitor), Dr. G. A. Boulenger, F.R.S. (visitor), Prof. F. E. Weiss, F.R.S. (who suggested the term “cytogenetic” as preferable to “karyogenetic”), Mr. W. B. Brierley, Mr. E. S. Russell, B.Sc. (visitor), and the Author replied.

February 19th, 1920.

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 5th February, 1920, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

The President announced from the Chair that intelligence had been received that morning of the death of Prof. Pier' Andrea Saccardo, thus causing another vacancy among the Foreign Members.

The following proposed alterations in certain Bye-Laws were read from the Chair for the first time:—

Chap. II. Sect. 2, for “Three Pounds” substitute “Four Pounds.”

Chap. II. Sect. 6, delete “who owe more than two Annual Contributions,” and insert in place thereof “whose Annual Contributions are due and owing.”

The said sections as altered will run thus, the alterations being shown in italic type:—

Chap. II. Sect. 2. Every Fellow shall also before he is admitted pay the First Annual Contribution of *Four Pounds*, and he shall pay the like Sum annually in advance on each successive 24th Day of May, so long as he shall continue a Fellow; provided, however, that Fellows elected between the 1st Day of March and the 24th Day of May in any year, shall not be liable for a second Annual Contribution until the 24th Day of May in the year following that in which they were elected.

Chap. II. Sect. 6. In the month of November in each year the Council shall cause to be suspended in the Library of the Society a list of the Fellows *whose Annual Contributions are due and owing*, and notice thereof shall forthwith be forwarded to every Fellow whose name appears in such list. If the contributions due from any Fellow named in the said list shall not have been paid within three months after the first suspension of the list the Council may remove such Fellow from the Society, but notwithstanding such removal the obligation of any Fellow so removed may be put in suit for the recovery of any money due from him to the Society. The Council may remit in whole or in part the contributions due from any Fellow.

Mr. J. S. HUXLEY, M.A., Fellow of New College, Oxford, and Mr. D. F. LENEX exhibited living specimens of sexually mature Axolotls metamorphosed into the *Amblystoma* form by feeding with thyroid gland, and of *Urodele* larvæ precociously metamorphosed by treatment with iodine solution.

A discussion followed in which the President, Prof. E. S. Goodrich, F.R.S., Sec.L.S., Mr. E. Boulenger (visitor), Lt.-Col. J. H. Tull Walsh, Dr. W. Bateson, F.R.S., and Dr. J. R. Leeson engaged, Mr. Huxley replying.

Major H. C. GUNTON read a paper entitled "Entomological-Meteorological Records of ecological facts in the life of British Lepidoptera," which was communicated by the General Secretary.

The Author believed that interesting facts would be obtained by recording and plotting the results of observations made by a number of entomologists in various localities. The scheme exhibited was derived from his notes from February to December 1919, within a radius of four miles from Gerrard's Cross, Bucks, which includes oak and beech woods, heath, marsh, and cultivated land. Special signs are used to denote the occurrence of species of macro-lepidoptera, on sallow-bloom in the spring, on ivy in the autumn, on sugar, and towards light. Thirty-five species of butterflies and two hundred and forty species of moths are thus

tabulated and correlated with meteorological data. The diagram places many facts before the eye, as the long continuance of certain species, the presence of more than one brood and the like. Sugar hardly appeals when honey-dew is abundant, and artificial light is ineffective during bright moonlight. Other problems, as of immigration, still await solution.

Mr. Stanley Edwards contributed further remarks.

March 4th, 1920.

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 19th February, 1920, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Dr. William Rushton Parker was admitted a Fellow.

Certificates in favour of the following were read for the first time:—Shankar Purushottam Agharkar, M.A., Ph.D., John Wishart, M.D., D.Sc., Ch.B., Mr. Howard Hamp Crane, Mr. Eric Fitch Daglish, Ph.D., Capt. R.F.A., and Mr. Bertram Henry Buxton: with the following for the second time:—Mr. Jacques de Vilmorin, Mr. Arthur Lionel Goodday, Lieut. R.G.A., Geoffrey Douglas Hale Carpenter, B.A., D.M., M.B.E., and Mr. Arthur Stauley Hirst.

The following were nominated as Foreign Members:—Prof. Gaston Bonnier (Paris), Prof. Victor Ferdinand Brotherus (Helsingfors), Prof. Giovanni Battista De Toni (Modena), Prof. Louis Dollo (Brussels), Prof. Paul Marchal (Paris), and Prof. Roland Thaxter (Cambridge, Mass.).

Mr. Ernest William Swanton was proposed as an Associate.

The President read for the second time from the Chair, the proposed alterations in Sections 2 & 6 of Chapter II. of the Bye-Laws.

Mr. T. A. DYMES, by favour of the President and on the ground that he would be unable to be present at the following meeting, read a statement concerning the proposed alterations.

The General Secretary, on behalf of Mr. GERALD W. E. LODER, drew attention to ten out of the first twelve numbers of Curtis's 'Botanical Magazine' in the original blue-grey wrappers, and pointed out the information which is lost when the wrappers are destroyed by the bookbinder.

In the present case, no. 1 belongs to the reprint of 1793; it contains the regulations for the use of the Brompton Botanic Garden, and on the fourth page, the contents of No. 77 of the 'Flora Londinensis' namely, *Scilla autumnalis*, *Hieracium umbellatum*, *Carduus polyacanthus*, *C. tenuiflorus*, *Valeriana officinalis*, and *Primula officinalis*.

The communication brought before the Society was entitled "A Contribution to our knowledge of the Botany of New Caledonia."

The subject of this communication is the collection made by Prof. R. H. COMPTON in New Caledonia and the Isle of Pines during 1914, with the aid of money grants from the Royal Society, the Percy Sladen Memorial Fund, and the Wort's Travelling Fund of Cambridge University. The specimens collected have been presented to the British Museum, and the greater part have been worked out in the Department of Botany at that institution. Since his return, Mr. Compton has been appointed Professor of Botany in the Cape Town University, and Director of the new botanic gardens at Stellenbosch. The various groups have been elaborated by the following botanists: Ferns and Gymnosperms by Prof. R. H. COMPTON, Flowering Plants by Mr. E. G. BAKER, Mr. SPENCER MOORE, and Dr. A. B. RENDLE, Mosses by Mr. I. THÉRIOT, Hepatics by Prof. J. B. FARMER, Maritime Algae by Mr. A. GEPP, Freshwater Algae by Dr. NELLIE CARTER, Fungi by Miss E. M. WAKEFIELD, Lichens by Miss A. LORRAIN SMITH, Characeæ by Mr. JAMES GROVES, and Mycetozoa by Miss G. LISTER.

Dr. RENDLE gave a short account of the position and physical characters of the island; and referred to previous work on its flora and its general characters. Important features are the igneous rocks which form a mountain chain of gneiss in the north-east, and the serpentine formation which covers the southern portion and occurs in larger or smaller areas throughout the island. The climate is mesothermic; the rainfall is relatively abundant, but owing to evaporation and the porous nature of the soil, many parts of the country have an arid appearance.

The flora is rich, and the proportion of endemic forms exceptionally high. The relative proportions of the different families of flowering plants in the present collection are very similar to those recently worked out by Mr. Guillaumin for the flora as a whole, the four families which contain the highest number of species being Euphorbiaceæ, Rubiaceæ, Orchidaceæ, and Myrtaceæ in each case. The main affinities of the flora are with Indo-Malaya and South-East Australia, the former represented chiefly



in the forest regions and the latter in the scrub and savannah regions; and a study of it suggests that New Caledonia is a very ancient land mass which has been isolated for a very long period.

Dr. RENDLE also gave a résumé of Mr. Compton's account of the Ferns and Gymnosperms. The latter are of great interest; they number about 27 and are all endemic. Mr. BAKER referred to a number of interesting specimens among the Dicotyledonous flowering plants which included many novelties. Miss LORRAIN SMITH gave an account of the Lichens, which include a new genus and a fair proportion of new species. Miss E. M. WAKEFIELD referred to the Fungi, the geographical distribution of which showed points of interest; and Miss G. LISTER described the small collection of Mycetoza.

The President, Miss A. L. Smith, Mr. C. C. Lacaita, Mr. H. N. Ridley, Dr. J. C. Willis, and Mr. T. A. Sprague commented on the collections.

March 18th, 1920.

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 4th March, 1920, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Mr. Edward Heron-Allen, F.R.S., Prof. Vernon Herbert Blackman, F.R.S., and Dr. James Davidson were admitted Fellows.

Dr. Otto Rosenheim, F.C.S., and Mr. William Harold Pearsall, M.Sc.(Manch.), were proposed as Fellows.

A Certificate in favour of Professor William Grant Craib, M.A.(Aberd.), was read for the second time.

The following were severally balloted for and elected Fellows:— Mr. Jacques de Vilmorin, Mr. Arthur Lionel Goodday, Lieut. R.G.A., Geoffrey Douglas Hale Carpenter, M.B.E., B.A., D.M., and Mr. Arthur Stanley Hirst.

The proposed alterations in Chap. II. Sections 2 and 6, read from the Chair on the 19th February and 4th March, were again

read by the President, who explained the reasons which had obliged the Council to submit these alterations to a ballot by the Fellows, and invited discussion.

Prof. WEISS, F.R.S., commented on the proposed changes, and suggested a reference to the Council, which was at a later stage embodied as a motion; he was followed by the Treasurer (who emphasized the need of a strengthening of the powers of the Council in the matter of Fellows in arrear), Mr. J. C. Shenstone, and Dr. A. B. Rendle, F.R.S., Sec. L.S.

The Fellows present then proceeded to ballot, and the votes having been counted, the President declared that both proposed alterations had been approved by the Fellows; as regards Sect. 2, by 37 in favour and 6 against, 49 Fellows being present, and that Sect. 6 had been approved by 37 in favour with 3 against, in each case by a two-thirds majority of Fellows present. The alterations were thereupon declared by the President as passed by the Fellows.

Prof. Weiss thereupon moved:—"That the Council be asked to consider the question of a reduction of payment in the case of Fellows who do not desire to take the publications," which being seconded by Miss M. Carson, was put to the vote by show of hands, and carried.

Prof. JAMES SMALL, D.Sc., F.L.S., then gave a lantern demonstration of "The Chemical Reversal of Geotropic Response in Roots and Stems." (Printed as a paper in 'The New Phytologist,' xix. nos. 3 & 4, 1920.)

In the discussion which followed, Prof. Weiss, F.R.S., Capt. A. W. Hill, Prof. V. H. Blackman, F.R.S., and Prof. E. S. Goodrich, F.R.S., Sec. L.S., took part.

April 15th, 1920.

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 18th March, 1920, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

The following were proposed as Fellows:—Mr. Raymond Alfred Finlayson, and Mr. Tom Russell Goddard.

Certificates in favour of the following were read for the second time:—Mr. Sydney Percy-Lancaster, Mr. Herbert William

Pugslev, B.A.(Lond.), Mr. Joseph Omer-Cooper, Miss Lucy Ellen Cox, B.Sc.(Lond.), George Kenneth Sutherland, M.A., D.Sc.(Aberd.), Mr. Harry Bertram Harding, and Mrs. Herbert Spencer Harde (Elinore Egerton Harde).

Professor William Grant Craib, M.A.(Aberd.), was elected a Fellow, and Mr. Ernest William Swanton, an Associate.

The President read the following Resolution which had been referred to the General Meeting for discussion and adoption:—

This Meeting of the Linnean Society views with alarm and indignation the proposal to introduce a private Bill into Parliament with the object of securing the enclosure of portions of Wanstead Flats and Epping Forest for permanent allotments and calls upon the Government to oppose this attempt to nullify the provisions of the Epping Forest Act of 1878, which requires the Forest to be preserved "un-enclosed . . . as an open space for the recreation and enjoyment of the public" for ever.

Mr. R. Paulson, President of the Essex Field Club, explained the reason for this appeal, and the discussion was continued by the Rev. Canon Bullock-Webster, Mr. H. R. Darlington, Mr. Lester-Garland, Lt.-Col. J. H. Tull Walsh, Mr. Stanley Edwards, Dr. A. B. Rendle, and Dr. W. R. Parker.

Upon a vote being taken it was decided to postpone action until more definite information could be obtained of the proposed Bill.

Capt. F. KINGDON WARD, B.A., F.R.G.S., gave an account of his "Natural History Exploration on the North-East Frontier of Burma," which was illustrated by a series of lantern-slides.

Mr. H. N. Ridley, Dr. O. Stapf, and the President contributed additional remarks, and the Lecturer replied.

Mr. R. PAULSON, F.L.S., showed lantern-slides illustrating definite stages in the Sporulation of *Gonidia* within the thallus of the lichen *Evernia Prunastri*, Ach.

Captain J. Ramsbottom spoke in support of the views put forward by the author.

May 6th, 1920.

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 15th April, 1920, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Mr. Arthur Lionel Goodday was admitted a Fellow.

Mr. William Henry Kitching, Mr. Chintaman Mahader Tembé, Mr. Rowland Maurice Richards, Louis, Vicomte de Sibour, F.Z.S., Mr. Rustom Hormasji Dastur, B.Sc. (Bombay), and Mr. John William Bodger, were proposed as Fellows.

Certificates in favour of the following were read for the second time:—Mr. Edmund Gustavus Bloomfield Meade-Waldo, Mr. Pyari Mohan Debbarman, B.Sc., Prof. Otto Vernon Darbishire, B.A., Ph.D., Mr. William Rickatson Dykes, M.A. (Oxon.), LèsL. (Paris), Prof. Shankar Purushottam Agharkar, M.A., Ph.D., Dr. John Wishart, Howard Hamp Crane, Capt. Eric Fitch Daghish, Ph.D., Mr. Bertram Henry Buxton, and Prof. Otto Rosenheim, Ph.D., F.C.S.

The following were balloted for and elected:—*Fellows*: Mr. Sydney Percy-Lancaster, F.R.H.S., Herbert William Pugsley, B.A. (Lond.), Mr. Joseph Omer-Cooper, Miss Lucy Ellen Cox, B.Sc. (Lond.), Dr. George Kenneth Sutherland, M.A., Mr. Harry Bertram Harding, F.R.M.S., and Mrs. Elinore Egerton Harde; *Foreign Members*: Prof. Gaston Bonnier, Prof. Victor Ferdinand Brothers, Prof. Giovanni Battista de Toni, Prof. Louis Dollo, Prof. Paul Marchal, and Prof. Roland Thaxter, Ph.D.

The President remarked upon the recent issue of two new volumes of the Ray Society, which were shown on the table, namely, 'British Orthoptera,' by Mr. Lucas, and the first volume of the 'British Charophyta,' by Mr. Groves and Canon Bullock-Webster.

The following Auditors were proposed, and elected by show of hands:—For the Council: Mr. E. T. Browne, Mr. Stanley Edwards; for the Fellows: Mr. T. A. Dymes, Mr. R. Paulson.

Dr. G. P. BIDDER, F.L.S., read three communications on Sponges, entitled:—(1) "The Fragrance of Calcinean Sponges," (2) "*Syncrypta spongiarum*," and (3) "Notes on the Physiology of Sponges."

The discussion which followed was maintained by Prof. Dendy, Mr. Harold Russell, and Mr. J. B. Gatenby (visitor), the Author replying.

Mr. EDWARD J. BEDFORD showed a series of thirty exquisite water-colour drawings of British Marsh and Spotted Orchids, with their numerous varieties and hybrids, further illustrated by 70 lantern-slides from his photographs of the growing plants *in situ*, and enlarged views of the lip, front and side views (See p. 65.)

Mr. H. W. Pugsley and Mr. T. A. Dymes contributed further remarks: the latter exhibited a series of fruit capsules, and remarked on the characters afforded by these variable plants in their fruits and seeds; Mr. Bedford briefly replying.

May 27th, 1920.

*Anniversary Meeting.*

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 6th May, 1920, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Dr. Vedāranyeśnara Vaidyanātha Ramana-Śāstrin, and Lieut.-Col. Anthony Hurl Wolley-Dod, R.A., were proposed as Fellows.

The number of Fellows was reported to be 700, with 10 for ballot at the next ensuing General Meeting.

The Treasurer made his Annual Report on the Accounts of the Society, and the Statement (see pp. 22-24), duly audited, was received and adopted.

Dr. J. R. LEESON drew attention to the great need of a new Catalogue of the Library.

The General Secretary stated that the MS. was practically ready for printing, and in reply to further questions, said that the edition of 1896 was out of print, the whole of the 1000 copies printed having been sold.

The General Secretary reported that since the last Anniversary the following had died or their deaths been ascertained, namely:—

16 Fellows.

Lt.-Col. Linley Blathwayt.	The Rt. Hon. Alexander Peckover, Baron Peckover of Wisbech.
Henry G. Flanagan.	Sir Peter Wyatt Squire.
Ernest Gibson.	Henry Charles Stephens.
Frank Hicks.	Prof. James William Helenus Trail.
John Hopkinson.	John Sidney Turner.
Henry Owen Huskisson.	William James Tutchet.
Valavanur Subramania Iyer.	Prof. George Stephen West.
Rev. Edward Shearburn Marshall.	Alfred Prentice Young.

8 Foreign Members.

William Gilson Farlow.	Pier' Andrea Saccardo.
Ernst Heinrich Haeckel.	Simon Schwendener.
Wilhelm Pfeffer.	Franz Steindachner.
Magnus Gustaf Retzius.	Hermann von Vochting.

That the following 19 Fellows had withdrawn:—

Oliver Vernon Aplin.	Benjamin Thompson Lowne.
Robert William Ascroft.	Gregory Macalister Mathews.
Bernard Francis Cavanagh.	Albert Davidson Michael.
Catherine, Lady Crisp.	Albert Charles Frederick Morgan.
Hamilton Herbert Charles	Miss Winifred Smith.
James Druce.	George Brettingham Sowerby.
Rev. Robert Gardner-Smith.	Mrs. Mary Newman Tremearne.
Arthur Woldemar Geffcken.	James Walter White.
William Henry Johnson.	John Charles Wilson.
Alfred Ernest Knight.	William Wise.

And that the Council had removed the following from the List, in accordance with the Bye-Laws, Chap. II. Sect. 6:—

Alfred Eastham.	Joseph Crosby Smith.
James Thomas Hamilton.	

During the same period 40 Fellows have been elected, of whom 33 have qualified up to the present. Also 6 Foreign Members and 1 Associate have been elected.

The Librarian's report was read, showing that donations from private individuals and editors amounted to 40 volumes and 232 pamphlets and parts, by exchange 153 volumes and 375 detached parts, by purchase 59 volumes and 263 parts; in all, the accessions amounted to 243 volumes and 870 pamphlets and separate parts.

Books bound amounted to 564: 28 in half-morocco, 29 in buckram, 133 in half-buckram, 89 in cloth, with 285 rebacked.

The General Secretary having read the Bye-laws governing the Elections, the President opened the business of the day, and the Fellows present proceeded to ballot.

The Ballot for the Council having been closed, the President appointed Prof. Weiss, Mr. T. A. Dymes, and Mr. W. S. Rowntree Scrutineers; and these, having examined the ballot-papers and cast up the votes, reported to the President, who declared the Council to be as follows:—

EDMUND G. BAKER, Esq.; Prof. MARGARET BENSON, D.Sc.; E. T. BROWNE, M.A.; \*HENRY BURY, M.A.; STANLEY EDWARDS, F.Z.S.; Prof. J. B. FARMER, F.R.S.; Prof. E. S. GOODRICH, F.R.S.; \*Capt. A. W. HILL, M.A., D.Sc.; Dr. B. DAYDON JACKSON; C. C. LACAITA, M.A.; GERALD W. E. LODER, M.A.; HORACE W. MONCKTON, F.G.S.; R. I. POCOCK, F.R.S.; Dr. A. B. RENDLE, F.R.S.; \*The Rt. Hon. LIONEL WALTER, BARON ROTHSCHILD, F.R.S.; \*Dr. E. J. SALISBURY; \*CHARLES EDGAR SALMON, Esq.; Miss A. LORRAIN SMITH; Lt.-Col. J. H. TULL WALSH; Dr. A. SMITH WOODWARD, F.R.S.

(New members are shown by an asterisk. The retiring Councillors were: Dr. W. BATESON; R. H. BURNE, Esq.; Dr. D. H. SCOTT; A. W. SUTTON, Esq.; and Dr. HAROLD WAGER.)

The Ballot for the Officers having been closed, the President appointed the same Scrutineers; and these, having examined the Ballot-papers and cast up the votes, reported to the President, who declared the result as follows:—

*President:* Dr. ARTHUR SMITH WOODWARD, F.R.S.

*Treasurer:* HORACE W. MONCKTON, F.G.S.

*Secretaries:* Dr. B. DAYDON JACKSON.

Prof. E. S. GOODRICH, F.R.S.

Dr. A. B. RENDLE, F.R.S.

The President then delivered an Address, on certain groups of fossil Fishes, illustrated by a series of lantern-slides (see p. 25).

TREASURER'S ACCOUNTS FOR THE YEAR ENDED APRIL 30TH, 1920.  
(Presented at the Anniversary Meeting, May 27th, 1920.)

*Receipts and Payments of the Linnean Society from May 1st, 1919, to April 30th, 1920.*

*General Account.*

<i>Receipts.</i>		<i>Payments.</i>	
	£ s. d.		£ s. d.
Balance at Bankers on 1st May, 1919.....	444 13 7	Taxes and Insurance .....	24 9 3
Cash in hand.....	2 1 4	Repairs and Furniture .....	84 15 9
Interest on Investments .....	308 5 11	Coal, Electric Current, and Gas .....	94 19 2
Admission Fees .....	192 0 0	Salaries .....	907 19 9
Annual Contributions .....	1668 0 0	Library:—	
Compositions.....	179 0 0	Books (New Books £22 18 0).....	£107 11 1
		Binding.....	176 7 11
Sales of Publications:—			283 19 0
Transactions .....	£23 5 4	Expenses of Publications:—	
Journals .....	125 15 4	Printing .....	£788 7 0
Proceedings and Catalogues .....	8 8 3	Illustrations .....	156 10 7
	157 8 11	Distribution .....	56 19 9
Fellows' postal account, deposits .....	16 16 3	Miscellaneous Printing and Stationery .....	1001 17 4
Donations in aid of Publications .....	66 0 0	Petty Expenses (including Tea and Postage) £115 3 5	228 13 1
Miscellaneous Receipts .....	8 2 6	Fellows' postal account .....	6 18 1
		Investments £126 15 2 5% War Loan, 1920-17 .....	122 1 6
		Linnean Medal.....	119 18 2
		Balance at Bankers, 30th April, 1920	15 5 0
		(including £101 11 0, deposits, Fellows'	
		postal account) .....	£152 0 4
		Cash in hand .....	6 9 11
			158 10 3
			<hr/>
			£3042 8 6



*Separate Account.*

	£	s.	d.
To Balance at Bankers, 1st May, 1919:—			
Westwood Fund .....	£4	9	1
Trail Award Fund .....	15	16	0
Crisp Award Fund .....	14	3	4
Hooker Lecture Fund .....	2	9	4
Tagart Fund .....	17	6	4
	54	4	1
Donations:—			
Goodenough Fund .....	£83	19	6
Library Catalogue Fund .....	1	1	0
	85	0	6
Interest on Investments:—			
Westwood Fund .....	£8	5	6
Trail Award Fund .....	3	10	0
Crisp Award Fund .....	6	6	4
Hooker Lecture Fund .....	20	11	2
Tagart Fund .....	14	5	10
Goodenough Fund .....	17	11	—
	53	16	9
	£193	1	4
By Binding of Books (Tagart Fund) .....			
Cost of conversion of £100 National War Bonds into £150 4% Victory Bonds:—			
Westwood Fund .....	£12	10	0
Hooker Lecture Fund .....	2	9	11
Tagart Fund .....	12	10	1
	27	10	0
Purchase of £50 Victory Bonds 4%:—			
Goodenough Fund .....			
Balance at Bankers, 30th April, 1920:—			
Westwood Fund .....	£	4	7
Trail Award Fund .....	19	6	0
Crisp Award Fund .....	20	9	8
Hooker Lecture Fund .....	20	10	7
Tagart Fund .....	18	5	7
Goodenough Fund .....	42	16	11
Library Catalogue Fund .....	1	1	0
	122	14	4
	£193	1	4

*Investments on April 30th, 1920.*

*General Account.*

	£	s.	d.
Forth Bridge Railway 4 per cent. Stock .....	450	0	0
Metropolitan Consolidated 3 per cent. Stock .....	1000	0	0
India 5 per cent. Stock .....	124	0	0
Eastern Bengal Railway 4 per cent. Debenture Stock .....	1000	0	0
Great Western Railway 4 per cent. Debenture Stock .....	1000	0	0
Midland Railway 2½ per cent. Perpetual Preference Stock .....	300	0	0
5 per cent. War Loan, 1920-47 Inscribed (including £315 15s. 9d. resulting from conversion of £300 National War Bonds in last year's Accounts) .....	3200	0	0
	£4500	0	0
	£5549	5	0

*Balance, 30th April, 1920.*

	£	s.	d.
at 62½ .....	281	5	0
at 60 .....	600	0	0
at 48 .....	576	0	0
at 62½ .....	625	0	0
at 67 .....	670	0	0
at 39 .....	117	0	0
at 83½ .....	2680	0	0
	£5549	5	0

*Separate Account: Investments on April 30th, 1920.*

	£	s.	d.		£	s.	d.
£870 9 5	232	5	0	Metropolitan Water Board 3 per cent. "B" Stock (Westwood Fund)	a 49	113	16 0
	638	4	5	ditto (Hooker Lecture Fund)	a 49	312	14 7
	100	0	0	New South Wales 3½ per cent. Stock, 1939-50 (Trail Award Fund)	a 60½	60	10 0
	252	18	0	2½ per cent. Consolidated Stock (Crisp Award Fund)	a 47	118	17 3
	530	0	0	East India Railway 3½ per cent. Debenture Stock (Taggart Fund)	a 54½	288	17 0
				(Westwood Fund) .....			
	50	0	0	(Taggart Fund) .....	a 77½	155	0 0
£200 0 0	50	0	0	(Hooker Lecture Fund) .....			
	50	0	0	(Goodenough Fund) .....			
	50	0	0	4 per cent. Victory Bonds (including £118 resulting from conversion of £100 National War Bonds in last year's accounts).			
						£1019 14 10	

HORACE W. MONCKTON, *Treasurer.*

We have in conjunction with the Professional Auditor, who certifies as to all details audited the Accounts of the Society for the year ended 30th April, 1920, and found them correct. We have verified the Investments and Bank Balances.

Dated this 13th May, 1920.

W. B. KEENE, *Chartered Accountant.*

A. SMITH WOODWARD,  
ROBERT PAULSON,  
STANLEY EDWARDS,  
T. A. DYMES,  
EDWARD T. BROWNE,  
E. DAYDON JACKSON, } *Auditors.*

## PRESIDENTIAL ADDRESS, 1920.

DURING his various travels, especially in Oeland, Gotthland, and Scania, Linnaeus became much interested in the petrified remains of animals and plants which he and his students collected from the stratified rocks. He made careful observations on their mode of occurrence, compared his results with those already published by naturalists in other countries, and eventually, in the 12th edition of his *Systema Naturæ*, devoted an important section to the arrangement and interpretation of the numerous "petrifications" by that time known. He quoted with approval the Italian Ramazzini's remark that the layers of rock should be considered as representing a succession of ages rather than as "the tumultuous jumble of the general deluge." In the quaint words of Dr. William Turton's translation, he concluded:—"The intelligent investigator will not therefore straiten the limits of an useful science, by disregarding the ancient inhabitants of the globe, though unknown to modern naturalists."

Since this wise and far-seeing observation of Linnaeus in 1768, "the ancient inhabitants of the globe" have indeed been much "regarded," and it has become increasingly clear that they must always be taken into account when the wider problems of life are being considered. Not long after the foundation of the Linnean Society towards the end of the eighteenth century, the succession of extinct animals and plants was sufficiently understood to show that there had been a gradual progression of life on the earth from the lowest to the highest, and that the existing world was only the consummation. When the details of the extinct forms were studied, the differences between the past and the present appeared to be even more marked. Still later, especially after the work of Darwin, when explorations and collections multiplied, many definite progressive and retrogressive series of animals were recognised as they were traced through geological time. Eventually, during more recent years, curious parallel developments have been noticed in many groups of different classes, which suggest that certain changes are inevitable and are the successive marks of immaturity, dominance, and old age in each race. It is, in fact, difficult to be sure of the real meaning of the characters and distribution of any group of organisms as it exists to-day without some knowledge of its ancestry in the past.

Unfortunately, in most cases, this ancestry is unattainable; for organic remains are only preserved in rocks by accident, and animals at any rate are rarely represented by more than their skeletons. The vast majority of the most interesting generalised types of past ages must have lacked hard parts which could be fossilised; and even those which are represented by skeletons are not easily interpreted unless they happen to have close allies among existing life.

As an illustration of the difficulties and limitations in the study of extinct animals, I would refer to the earliest geological evidence of the Vertebrata which I have long had the opportunity of investigating. The oldest fossils which are comparable with vertebrate skeletons can scarcely belong to animals lower in grade than the existing Cyclostomes, and they are all either too vaguely shown or too highly specialised to give any satisfactory clue to the invertebrate group from which they were descended. In outward shape many of the armoured forms much resemble the contemporary Merostomata and the later marine Arachnids, but to recognize any genetic connection, such as is advocated by Gaskell\* and Patten†, involves more assumptions than are justifiable. The most generalised forms found as fossils are all distinctively fish-shaped, and there can be no doubt that the really annectant types which preceded them were soft-bodied and not likely to be preserved.

These earliest vertebrates occur abundantly in some of the uppermost Silurian deposits of western and northern Europe, but most of them have so slight a skeleton that they appear as mere stains on the surface of the rock. Interesting though tantalising new specimens have lately been collected by Mr. William McPherson for the British Museum from the Downtonian shales of Ayrshire. Even those genera in which the skin is provided with well-calcified shagreen or scales show very little beyond their general contour. Fortunately, however, they are followed in the overlying Devonian formations both of Europe and North America, and even of the southern hemisphere, by numerous more specialised members of the same group, in which many of the dermal tubercles have coalesced with a deeper-seated calcification into symmetrically-arranged plates, which often bear marks of subjacent internal organs. It is thus possible to make some attempt at their interpretation.

Some have doubted whether all these primitive organisms belong to a single group, but I still think Cope was probably right when he included all those known to him in his subclass Ostracodermi (or Ostracophori). The genera without armour-plates discovered in more recent years seem to pass by gradations into the others, and therefore presumably had the same fundamental characters. The anterior visceral arches are not modified into ordinary jaws—at least, if they were so, we should expect to find them either calcified or covered with a corresponding exoskeleton. The gill-arches, in an extensive gill-chamber, are far forwards. There are no paired fins; while in the median fins there are no ordinary fin-rays, but rows of scales instead. The dermal plates, when present, are highly vascular, and they always retain as a superficial layer the tubercles of dentine which are the sole covering of the more generalised forms.

\* W. H. Gaskell, 'The Origin of Vertebrates' (London, 1908).

† W. Patten, 'The Evolution of the Vertebrates and their Kin' (Philadelphia, 1912).

## ANASPIDA.

The most isolated and least-known order of the Ostracoderms is that of the Anaspida, which are either fusiform free-swimmers or elongated and almost eel-shaped. They are usually only from 10 to 15 cm. in length, and with one exception they are known only from the Downtonian Passage Beds at the top of the Silurian System. They are probably to be regarded as the latest survivors of the ancestral Ostracoderms, which were beginning to acquire a hard dermal skeleton at the end of Silurian times.

The Anaspida were first described from Ayrshire and Lanarkshire by Traquair\*, who recognised two genera, *Birkenia* and *Lasanius*. *Birkenia* is completely covered with scales, which are fusiform and rather irregularly arranged on the head, but deep and narrow and disposed in oblique lines inclined forwards and downwards on the trunk. A single row of enlarged scutes extends along the lower border of the trunk; and small scales take the place of fin-rays on the single dorsal fin and on the lower lobe of the distinctly heterocercal tail. Low on the side of the head there is the orbit, surrounded by large plates resembling the circumorbital plates of the Acanthodian fishes; behind the head an oblique line of pores may be interpreted as gill-openings; while a double scute at about the middle of the ventral series probably marks the cloaca. Otherwise, there are no indications of the internal parts of the animal. *Lasanius* occurs as a mere stain on the rock, bounded below by the single series of ventral scutes, and partially armoured only in the foremost part of the trunk by a few oblique rows of scales, which are fused into rods showing a triangular expansion only at the point where they are crossed by the lateral line. The forked heterocercal tail is distinct, but I have never seen any ordinary fin-rays in its lower lobe. The eye is marked by a dark stain; and slight dermal calcifications seem to indicate the position of the row of supposed branchial openings corresponding with those of *Birkenia*.

A fragment, either of *Birkenia* or of a related genus, has been found in rocks of the same age in New Brunswick, Canada †, and three other Anaspida are now known from the Downtonian formation of southern Norway ‡. The latter have not yet been fully described, but one of them (*Pterolepis nitidus*) is specially interesting because its dorsal fin is armed with an anterior spine. Detached fin-spines (*Ouchus*) of Silurian age have generally been regarded as referable to Elasmobranch fishes, but this new discovery shows that they may belong to vertebrates of much lower grade.

\* R. H. Traquair, Trans. Roy. Soc. Edinb. vol. xxxix. (1899), pp. 837-843, pl. 5; also *loc. cit.* vol. xl. (1905), pp. 886-7, pl. 2, figs. 4 S.

† *Ctenopleuron nerepisense*, G. F. Matthew, Trans. Roy. Soc. Canada, ser. 3, vol. i. (1907), sect. 4, p. 7, pl. 1.

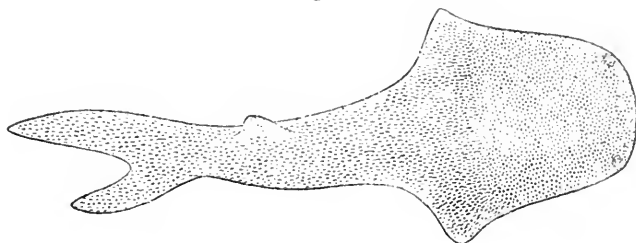
‡ J. Kier, Skrift. Vidensk.-Selsk. Kristiania, Mat.-naturv. Kl. 1911, no. 7, pp. 17-19.

That some Anaspida survived unchanged until the end of Devonian times seems to be proved by *Euphanerops longævus* from the Upper Devonian of Canada\*. They must, however, have been very rare or local, for hitherto they are known only by one specimen of the species just mentioned.

### HETEROSTRACI

The next order of Ostracoderms comprises families adapted for life mainly at the bottom of the shores, estuaries, or lakes in which they dwelt. They have a relatively large depressed head, and a small mobile tail ending in a heterocercal fin. Most of them are larger than the Anaspida, and they range upwards through the Devonian formations, increasing in size until in the Upper Devonian some of them (*Psummosteus*) are more than half a metre in length †. These are the largest Ostracoderms known.

Fig. 1.



Restoration of *Thelodus scoticus*, from the Downtonian Passage Beds of Lanarkshire, about one-half nat. size. The head shown from above, the tail twisted to be seen mainly in side-view. (After Traquair.)

The most abundant early members of the order in the Downtonian Passage Beds and the Upper Silurian are protected only by a nearly uniform covering of shagreen closely similar to that of sharks. When the isolated dermal tubercles of *Thelodus* were first discovered, indeed, they were regarded as belonging to Elasmobranch fishes; but it is now clear that this simplest type of vertebrate armature was also assumed by primitive fish-like organisms which show no other real resemblance to Elasmobranchs. As described by Traquair ‡, *Thelodus* (fig. 1) and *Lanarkia*, when crushed in their fossilised state, exhibit a broad head-region, rounded in front and truncated at the hinder border, from the middle of which the comparatively slender body-region

\* A. S. Woodward, Ann. & Mag. Nat. Hist. [7] vol. v. (1900), p. 416, pl. 10, fig. 1.

† A. S. Woodward, Ann. & Mag. Nat. Hist. [8] vol. viii. (1911), p. 649, pl. 9. For micro. structure see J. Kier, Rep. 2nd Norweg. Exped. 'Fram' 1898-1902, no. 33 (1915), pp. 24, 28, 35, pl. 3, figs. 3, 4, pl. 6, text-figs. 5, 8.

‡ R. H. Traquair, Trans. Roy. Soc. Edinb. vol. xxxix. (1899), pp. 829-854, pls. 1-4; and *loc. cit.*, vol. xl. (1905), pp. 880-883, text-figs. 1, 2.

is continued; the head being doubtless seen from above or below, while the body is usually twisted and displayed in side-view. The only traces of internal organs observed by Traquair were stains marking the position of the lateral eyes, paired parallel bars suggesting branchial arches, and (in a single specimen of *Lanarkia*\*) curious square spaces near the lateral border of the head apparently corresponding with the vacuities in the head-shield of *Eukeraspis* which I regard as being in the roof of the branchial chambers. In addition, I have observed in the lower lobe of the caudal fin of *Thelodus* undoubted indications of the stout cartilaginous hæmal spines of the vertebral axis.

Through *Kallostracon* and *Tolyptelepis* or *Tolyptaspis*†, the primitive Heterostraci just described seem to pass into *Cyathaspis*, *Palaaspis*, and *Pteraspis*‡, in which the shagreen-granules on the head are united into a few symmetrically-arranged plates by fusion with underlying calcified tissue. The shape and arrangement of these plates were probably determined by the disposition of the sensory canals which traverse them. Their superficial tubercles are fused into more or less concentric ridges: their middle layer is coarsely chambered for vascular spaces; their basal layer is usually laminated. In no part of the armour are there any bone-cells. The orbits are distinct at the sides of the base of the rostrum, and a pair of larger openings in the dorso-lateral plates near the hinder end of the shield are probably the outlets of the branchial chambers. The inner or visceral face of the large median dorsal plate, especially in *Cyathaspis*§, shows a small median pit just behind the position of the orbits evidently for the reception of a pineal body. Further back are a pair of >-shaped markings which may be due to the semicircular canals of the otic capsules. Near each lateral margin is a row of pittings which are probably the impressions of branchial pouches. One ventral shield of *Cyathaspis*, described by Leriche||, also bears corresponding impressions of the supposed branchial pouches. The body behind the shield is imperfectly known, but in *Pteraspis* it is scaly, and there can be no doubt that the body-cavity extended into it with the cloacal opening far back.

The Pteraspidiæ thus described, showing marks of internal soft parts, do not range upwards above the Lower Devonian. As they become fewer they are gradually replaced by another group

\* R. H. Traquair, *loc. cit.*, vol. xl. (1905), p. 882, pl. 2, figs. 2, 3.

† J. V. Rohon, *Mém. Acad. Imp. Sci. St.-Petersbourg* [7], vol. xli. no. 5 (1893), p. 76, pl. 1, figs. 42, 45, 47, and pl. 2, figs. 54, 56.

‡ E. Ray Lankester, in Powrie & Lankester, 'A Monograph of the Fishes of the Old Red Sandstone of Britain,' pt. i. (Paleont. Soc. 1868); also *Geol. Mag.*, vol. x. (1873), p. 241, pl. 10. A. S. Woodward, 'Catalogue of the Fossil Fishes in the British Museum,' pt. ii. (1891), pp. 159-176, with figs. G. Lindström, *Bihang K. Svensk. Vet.-Akad. Handl.*, vol. xxi. (1895), sect. iv. no. 3, with 2 pls. (*Cyathaspis*).

§ A. S. Woodward, *op. cit.* 1891, p. 172, pl. 9, fig. 4.

|| M. Leriche, *Mém. Soc. Géol. Nord.*, vol. v. no. 1 (1906), p. 25, pl. 1, fig. 5 text-fig. 7.

of Heterostraci, represented by larger species, which are also armoured with plates and scales, but show little or no trace of the underlying soft parts. *Drepanaspis* (fig. 2), from the Lower Devonian of Gmünden, Eifel, is the best known genus, and several specimens have been found with nearly all the dermal plates in their natural position. It is a much depressed, almost skate-shaped fish, with a very short rostrum and the orbits piercing a pair of small antero-lateral plates which are directed both laterally and upwards. As in the Pteraspidi-ans, the greater part

Fig. 2.

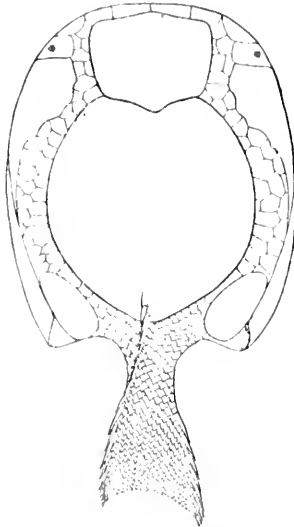


Fig. 3.

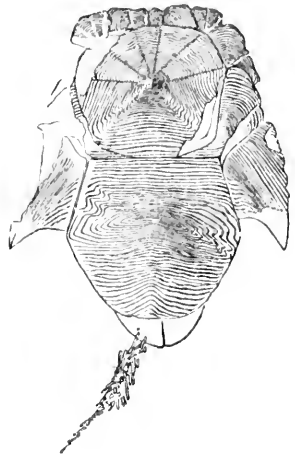


Fig. 2.—Restoration of *Drepanaspis gemundenensis*, dorsal aspect, from the Lower Devonian of Gmünden, Eifel, about one-quarter nat. size.

Fig. 3. Drawing of nearly complete fossil of *Phyllolepis concentrica*, dorsal aspect, from the Upper Old Red Sandstone, Dura Den, Fifeshire, about one-third nat. size. The lines radiating from the centre of the anterior median dorsal plate probably represent sensory canals. British Museum, no. P. 11912.

of the back is covered by two median plates, of which the hinder is the larger and cleft behind for the insertion of a small spine. Smaller plates surround these in front as well as at the sides, and the hindmost laterals seem to enclose a pair of branchial openings. Again, as in the Pteraspidi-ans, the greater part of the ventral surface is covered by one large median plate, and in front of this a number of small plates surround the mouth in an undetermined manner. The small scaly tail is laterally compressed, and the large fulcral scales on its dorsal border form a close series



beginning immediately behind the dorsal spine already mentioned, while the corresponding ventral series of fulcral scales stops at a short distance from the hinder border of the median ventral plate, leaving a gap doubtless for the cloacal opening.

When Traquair\* first interpreted *Drepanaspis* he reversed the dorsal and ventral aspects as just described, because he observed that the stronger and longer lobe of the tail was apparently on the same aspect as the single median plate, while the cleft in the hinder of the two opposing median plates might be regarded as the cloacal opening. The interpretation of Dean† and Kier‡, however, now adopted, seems to be confirmed by the recent discovery of a nearly complete specimen of *Phyllolepis* (fig. 3)§, which is evidently an Upper Devonian representative of the same group. Here the dorsal aspect is undoubtedly that on which the two median plates occur, and the ventral aspect bears only one large plate (perhaps paired) with an extensive gap in front for the mouth-parts. In front and round part of the sides of the median dorsal plates there is a single row of marginal plates, ending behind in a pair of backwardly-directed cornua; but the orbits do not pierce any of these plates, and their exact position, though evidently lateral, is uncertain. The small tail is scaleless, and in the fossil it shows remains of the superficially calcified neural and hæmal arches of the notochordal axis.

#### OSTEOSTRACI.

Another order of Ostracoderms with a large depressed head is armoured in this region with small polygonal plates, which are variously fused together. Bone-cells are conspicuous in all the hard tissue except the superficial layer of tubercles. The eyes are close together in the middle of the top of the head. The tail, as a rule, is relatively larger than that of the Heterostraci, ending in the usual heterocercal fin; and it is covered with scales, which are more or less deepened on the flank. The Osteostraci range from the Upper Silurian to the Upper Devonian, but are very rare above the Lower Devonian.

The armour of the typical widely-ranging genus *Cephalaspis* (fig. 4)¶ bears several indications of the underlying soft parts. The little plate between the orbits is marked by a pit, evidently for the pineal body; and in front of it there are other markings

\* R. H. Traquair, *Trans. Roy. Soc. Edinb.* vol. xxxix. (1899), p. 844, text-fig. 5; *loc. cit.* vol. xl. (1903), p. 725, pl. 1, figs. 1-3, pls. 2-4, text-figs. 1-3; *loc. cit.* vol. xli. (1905), p. 469, pls. 1-3; *Geol. Mag.* [4] vol. vii. (1900), p. 153, figs. 1-3; *loc. cit.* vol. ix. (1902), p. 289, figs. 1, 2.

† B. Dean, *Science*, n. s. vol. xix. (1904), p. 64.

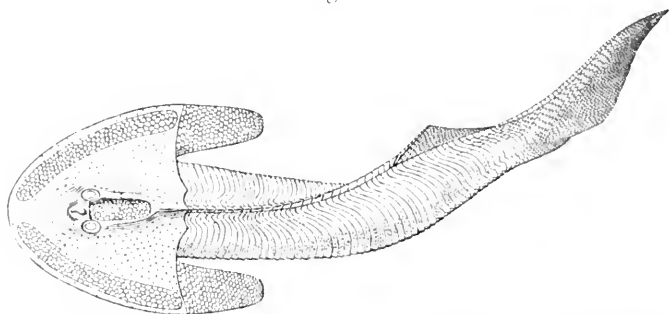
‡ J. Kier, *Rep. 2nd Norweg. Arctic Exped.* 'Fram' 1898-1902, no. 53 (1915), pp. 29, 33, pl. 3, figs. 5, 6, pl. 4, fig. 2, text-figs. 6, 7.

§ A. S. Woodward, *Rep. Brit. Assoc. (Australia, 1914)*, 1915, p. 122, pl. 2.

¶ See especially E. Ray Lankester in Powrie & Lankester, 'Fishes of the Old Red Sandstone,' pt. i. concluded (1870), and A. S. Woodward, 'Catal. Foss. Fishes B.M.,' pt. ii. (1891), pp. 177-193, with figs.

not yet interpreted, perhaps related to the olfactory apparatus. A conspicuous ovoid plate behind the orbits fills a vacancy in the roof of the brain-case. Along each side of the head-shield there extends a long narrow vacancy filled with loose polygonal plates, which form a flexible roof to a chamber within the inrolled rim of the shield. I regard this chamber as branchial, for it opens behind just within the cornu (or postero-lateral angle) of the head-shield, where a flexible flap stiffened by polygonal plates may be regarded as an operculum. In some specimens of the closely-allied genus *Auchenaspis* (or *Thyestes*) there are indeed traces apparently of the branchial arches close to the chamber on each side\*. The mouth must have been placed far forwards on the ventral surface, but no hard parts related to it have been observed. The body-cavity extended far back in the scaly tail,

Fig. 4.



Restoration of *Cephalaspis nurchisoni* from the Downtonian Passage Beds of Herefordshire, about one-half nat. size. The head shown from above the tail twisted to be seen mainly in side-view.

where the remote cloacal opening has been seen. *Cephalaspis* has only one dorsal fin, but the median scales in front of it form a curious elevated ridge along the back, and two dorsal fins have been observed in the allied genera *Aceraspis* and *Micraspis*†. All the fin-membranes are scaly, without true fin-rays.

*Auchenaspis* (or *Thyestes*)‡ is closely similar to *Cephalaspis*, only having some of the anterior body-scales fused with the hinder border of the head-shield. *Eukeraspis* is interesting as showing the flexible roof of the pair of branchial chambers subdivided by cross-bars; while in *Tremutaspis*§ this roof is reduced

\* J. V. Rohon, Verhandl. russ. k. min. Ges. St. Petersburg, [2] vol. xxxiii. (1895), p. 17; also Bull. Acad. Imp. Sci. St.-Petersb. vol. iv. (1896), p. 231, with figs.

† J. Kier, Skrift. Vidensk.-Selsk. Kristiania, Mat.-naturv. Kl. 1911, no. 7, pp. 16, 17.

‡ J. V. Rohon, Mém. Acad. Imp. Sci. St.-Petersb. [7] vol. xxxviii. no. 13 (1892), pp. 12-37, with figs.

§ W. Patten, Mém. Acad. Imp. Sci. St.-Petersb. [8] vol. xiii. no. 5 (1903).

on each side to two widely-separated areas, which have been mistaken for marks of sense organs\*. One remarkably preserved specimen of *Tremataspis* exhibits a small vertebrate brain of almost diagrammatic simplicity †; and several known shields of this genus are pierced above the position of the auditory organs by a pair of foramina which may represent the ductus endolymphaticus of each side. In *Tremataspis* and *Didymaspis* some of the anterior body-scales are fused into a plate both dorsally and ventrally, and this armour is firmly united with the head-shield. The extent of the dermal plates in these two genera is therefore as great as in the Heterostracan genera *Drepanaspis* and *Phyllolepis*.

The Osteostracans are connected with the most primitive Heterostracans, such as *Thelodus*, by *Atleaspis* ‡, from the Upper Silurian Passage Beds, in which the polygonal plates of the head-shield are not fused together into a rigid covering. Indeed, if geologists are not mistaken as to the age of the rocks in which they occur, nearly similar polygonal plates are among the earliest known fish-remains, even so ancient as the Ordovician period. The plates named *Astraspis desiderata* §, said to be found in the Ordovician near Canyon City, Colorado, U.S.A., are essentially similar in microscopic structure to those of the Osteostracans, except that they lack the laminated inner layer—the part of the armour which theoretically would be latest in development.

### ANTIARCHII.

The most highly specialised order of Ostracoderms occurs only in Middle and Upper Devonian formations, and its ancestral forms remain unknown. The head and the greater part of the trunk are covered with plates symmetrically arranged according to the disposition of the sensory canals; and a pair of movable lateral appendages, also encased in plates, is fitted anteriorly to the armour of the trunk. The small tail, ending in a heterocercal fin, is either scaly or naked. Bone-cells are present in all layers of the armour. The species of the Middle Devonian genus *Pterichthys*, familiar by the restoration of Traquair, attain a length of about 20 cm., while some species of the Upper Devonian genera *Bothriolepis* and *Asterolepis* are much larger ||. They were first grouped as Antiarcha by Cope, when he supposed he saw some relationship between them and the Ascidiæ.

\* C. Wiman, Bull. Geol. Inst. Uppsala, vol. xvi. (1918), p. 94.

† C. Wiman, *loc. cit.* 1918, p. 86, with text-fig.

‡ R. H. Traquair, Trans. Roy. Soc. Edinb. vol. xxxix. (1899), p. 834, pl. 4, figs. 6–12, text-fig. 2; also *loc. cit.* vol. xl. (1905), p. 883, pl. 2, figs. 9, 10, pl. 3, text-fig. 3.

§ C. D. Walcott, Bull. Geol. Soc. America, vol. iii. (1892), p. 166, pl. 3, figs. 6–14, pl. 4, figs. 1–4. C. R. Eastman, Proc. U.S. Nat. Mus. vol. lii. (1917), p. 238, pl. 12, figs. 5, 6.

|| R. H. Traquair, 'A Monograph of the Fishes of the Old Red Sandstone of Britain,' pt. ii. (Palæont. Soc. 1894–1913).

The eyes in these Ostracoderms are median as in the Osteostraci, but the small plate between them, pitted on its inner face for the pineal body, is loose, and close to it there is a peculiar complication of parts which cannot yet be explained. Two external plates in front of the mouth are denticulated, as if they were related to the margin of the mouth itself; and they are notched at the outer lateral ends, as if for nostrils. At the posterolateral angles of the head, where the branchial chambers seem to open in other Ostracoderms, there is a loosely-hinged plate on each side which may be regarded as an operculum. Markings on the inner face of some of the head-plates still await explanation.

The inner surfaces of the plates of the trunk as a rule exhibit no features specially related to the soft parts; but in one species, *Pterichthys cheouanus*, from the Middle Devonian of the Eifel, Germany, there is a peculiar structure which has hitherto escaped general consideration. It was first noticed by Rohon\* in a specimen which I studied with him in Petrograd in 1892, and I have since observed it in a second specimen in the British Museum (no. P. 8882). This structure is a nearly horizontal thin lamina of bone, marked by a longitudinal median suture, and thus evidently paired, extending firmly fixed across the base of the anterior median dorsal plate and ending abruptly just in advance of the posterior border of the plate. In fact, it bounds below a large dorsal chamber which is widely open behind. The nature of this chamber is uncertain, but the vertebral axis must have been well below it; and it denotes a fundamental difference between the Antiarchi and the Arthrodira (such as *Coccosteus*), which are sometimes still regarded as related.

The tail in *Pterichthys* is covered with rhombic scales and clearly heterocercal, with a single small dorsal fin; but in the other genera it must have been scaleless, and it has only been observed in one species of *Bothriolepis* peculiarly preserved as a stain on the rock from one formation and locality †.

The discovery of the tail of *Bothriolepis* in specimens from one very thin layer of rock in a cliff which had already been examined by many skilled collectors, illustrates well the accidental nature of advances in our knowledge of fossils. Whole shoals of the same species had been found in other layers of the same section, but without a trace of the tail. In the course of this brief address I have mentioned several cases in which our present acquaintance with important facts depends on one or two favourably preserved or fortunately broken specimens. I have tried to show how a palaeontologist correlates these isolated facts and arrives at least at a plausible conclusion. Our knowledge of all groups of extinct organisms has to be acquired in the same slow and laborious manner.

\* J. V. Rohon, Verhandl. russ. k. min. Ges. St. Petersburg. [2] vol. xxviii. (1891), p. 398, pl. 7, figs. 1, 2.

† W. Patten, Biol. Bulletin, vol. vii. (1904), p. 113, with figs.

Prof. F. E. WEISS then moved:—"That the President be thanked for his excellent address, and that he be requested to allow it to be printed and circulated amongst the Fellows," which resolution, having being seconded by Mr. H. N. RIDLEY, was put and carried with acclamation.

The President having acknowledged the vote of thanks, proceeded to address Dame HELEN GWYNNE-VAUGHAN, handing to her the Trail Award and Medal. He said:—

Dame HELEN GWYNNE-VAUGHAN,—

The Council of the Linnean Society gives to you the Trail Award and Medal as a mark of its appreciation of the researches in which you are at present engaged on the morphology and cytology of the fungi. For several years you have been a painstaking worker in cytology, especially in relation to fungi, and your early papers on the Ascomycetes may be particularly mentioned as important contributions to our knowledge. Among higher plants you have also studied to good purpose the vegetative divisions and the meiotic divisions of *Vicia Faba*. You have not only worked yourself, but have also stimulated others to follow the same fruitful course of research, and so have deserved well of our science. The Council looks forward with interest to the early publication of your new volume on the fungi, and I have much pleasure in handing to you this award and medal with its best wishes for your continued success.

The recipient returned her thanks.

The President then addressed Sir RAY LANKESTER, K.C.B., reciting his services to the study of Zoology, and handing to him the Linnean Medal in gold. He said:—

Sir RAY LANKESTER,—

The Council of the Linnean Society has awarded to you the Linnean Medal as a token of its admiration for your life-work in the advancement of zoological science. You have so completely traversed the whole field, not touching any subject without adorning it, that it is impossible briefly to enumerate your several services. You began early to combine a study of extinct animals with those now living, and your papers on fossils from the East Anglian Crag deposits and your classic monograph of Pteraspidian and Cephalaspidian fishes, published half a century ago, are pioneer works that will always retain their value. At the same time you devoted close attention to the Protozoa, especially gregarines and blood-parasites, and in 1871 you discovered the first known intracorpuseular parasite (*Drepanidium*) in the frog. Your early researches on the earthworm and other worms did much to elucidate the significance of the excretory organs (which you named nephridia), the cœlom, and the vascular system in Annelids.

You made fundamentally important observations on the development of the Mollusca (*Limnaea*, *Paludina*, *Cyclas*, etc.), determining among other matters the origin of the germ-layers; and you first clearly distinguished the true blood-vascular system from the cœlomic spaces in Mollusca and Arthropoda. You studied and described *Rhabdopleura*, an interesting colonial form in some respects intermediate between Polyzoa and Vertebrata (Protochordata). Among Arthropods, your valuable work on *Apus* was followed by your masterly exposition of the structure of *Limulus*, proving its relationship to *Scorpio* and thus separating it from the Crustacea. At the same time you contributed much to a proper understanding and classification of the Arachnida. Your researches on the structure and larval development of *Amphioxus* are of primary importance in vertebrate morphology; and your memoirs on *Okapia* and *Elucopus* are noteworthy contributions to our knowledge of the higher mammals. Since 1869 you have edited continuously the 'Quarterly Journal of Microscopical Science,' and kept it in the forefront of journals of zoology. You have also planned, edited, and partly written several volumes of an exhaustive Treatise on Zoology. You have stimulated work in others not only by your brilliant professional teaching and personal intercourse, but also by your more general writings, among which I may specially mention your articles in the 'Encyclopædia Britannica.' They are models of clear exposition, concentrating attention on the really essential and interesting points, with the omission of unnecessary detail. As one honoured by your friendship for the past thirty years, I can testify personally to the inspiring influence you have always exerted, and it gives me the greatest pleasure to be the means of handing to you this mark of esteem from the Council of the Linnean Society.

The recipient made an acknowledgment in reply as follows:—

MR. PRESIDENT and FELLOWS of the LINNEAN SOCIETY.—

I beg permission to say a few words in order to express to you my deep sense of the great honour you have done to me in conferring upon me the Linnean Medal. I feel sensible not only of the distinguished honour given by your selection of me as its recipient, but of the great personal kindness and good-will which have influenced you. You, Mr. President, are an old friend and colleague of long-standing, and so are others whom I see here—and many have been associated with me as pupils and fellow-workers in the laboratory. The Linnean Society has been a constant source of help and advantage to me since many years ago I first used its library and published papers in its 'Transactions.' I became a Fellow forty-four years ago. My actual recollection of the Society goes back to the year 1855, when I went with my father to fetch books from its house—formerly that of Sir Joseph Banks—in Soho Square. From that time onwards I have known and been kindly helped in every way by its officers.

My father's friend, the distinguished surgeon, Mr. George Busk, was Secretary of the Society for some years, and taught me in his own study, when I was a school-boy, to dissect the earthworm. Huxley, Hooker, Allman, Lubbock, Gwyn Jeffreys, and Günther were my advisers and senior friends. They were succeeded as leaders of the Society by my coevals, and now a younger generation are joining in the government of the Society and in kindness to me.

I cannot sit down without especially thanking my friend our President for the selection of the Ostracoderm Fishes as the subject of his address to-day. It was delightful to me to hear his references to my work on these fossils, done more than fifty years ago—and many entrancing pictures of cornstone quarries, of the exciting discoveries of novel specimens, of dear old friends, collectors, and colleagues—of good-luck and adventure—the romance of the hammer—have been floating through my mind. I have never heard a lecture which gave me so much pleasure. Dr. Smith Woodward's own investigations on the Ostracoderm fishes have been of great importance, and the high value of his judgment in all that relates to them and other extinct groups is so well established, that I am most gratified to find that after all the additions to our knowledge of Ostracoderms since 1870 he is still able to speak of my pioneer work with kindly consideration.

The President reminded the Meeting that the General Secretary had that day completed 40 years as a Secretary, and the latter bowed in acknowledgment.

The General Secretary having laid on the table certain obituary notices, the proceedings terminated.

#### OBITUARY NOTICES.

Lieut.-Col. LINLEY BLATHWAYT, who died at Eagle House, Bath-easton, his home for 37 years, was a member of the well-known family, the Blathwayts of Dyrham Park. He was the son of the Rev. C. B. Blathwayt, Rector of Langridge, where our late Fellow was born on 7th September, 1839. He entered Marlborough College in August 1850 and remained there till 1854, served in the Indian Mutiny Campaign with the 79th Highlanders, was present in China in 1860–62, the Bhutan Expedition in 1864–65, and then in civil employ in Assam and Chota Nagpur until his retirement in 1880.

On settling in 1882 at Bath-easton, Col. Blathwayt took up scientific pursuits. In 1883 he joined the Bristol and Gloucester Archaeological Society, our own Society 3rd December, 1885, and the Somerset Archaeological Society in 1891; in the latter year

he was chosen President of the Bath Microscopical Society; he was also a Fellow of the Entomological Society. He helped to draw up a list of the insects of Somersetshire for the Victoria History of that county. Latterly he had interested himself in bamboo culture, and made a list of 42 Bambuseæ in his garden. He left a widow and one son and one daughter. By his special request he was cremated. [B. D. J.]

WILLIAM GILSON FARLOW died at his home in Quincey Street, Cambridge, Massachusetts, on 3rd June, 1919, after an illness of three weeks. He was a frequent visitor to our country before the war, and his striking personality, his irrepressible humour and wide humanity, as well as his scientific distinction, secured him a joyful welcome. A keen sense of personal loss is felt by his many friends here.

Farlow was born in 1844, and graduated from Harvard College in 1870 with the degrees of A.M. and M.D., the medical course having been taken as a preparation for a scientific career. Botany and music were the pursuits that attracted him most during his student days. He had, indeed, already showed a strong predilection for cryptogamic botany, and after graduation he acted as assistant to Asa Gray. His first publications were 'Cuban Sea-weeds' (1871) and 'List of the Sea-weeds and Marine Algae of the South Coast of New England' (1871-1872). He relinquished his post in 1872, at Gray's advice, in order to continue his botanical studies in Europe. He first directed his course to Scandinavia, where he visited the elder Fries, Areschoug, and J. G. Agardh, and had the opportunity of examining their herbaria. His next journey took him to St. Petersburg to see the Ruprecht Herbarium of Algae. Most of his time, however, during these "wander years" was spent in a definite course of botany under the direction of de Bary at Strassburg. The students in de Bary's laboratory were given a decided bias towards cryptogamic botany, more especially fungi, and Farlow shared in the enthusiasm for this side of botanical research, though his first published investigation was on apogamy in Ferns: 'An asexual growth from the prothallus of *Pteris cretica*' (1874). Before leaving Europe, he devoted some weeks to an intensive study of lichens at Geneva with Jean Mueller. Finally, a French tour took him to Antibes and the French algologists, Bornet and Thuret.

On returning to America in 1874, Farlow was appointed to an assistant professorship at Harvard. His work during the following years dealt largely with plant pathology, and he published a series of papers on various destructive parasites. In 1879 he became Professor of Cryptogamic Botany, a position he occupied until his death, though he retired from active teaching in 1896 and devoted himself to the care and development of the herbarium and library. His publications during these years of activity were many and various; they dealt not only with scientific discovery, but with questions such as the 'Conception of Species' and the



'Laws of Nomenclature.' His book 'The Marine Algae of New England' (1881) gives descriptions of genera and species and an artificial key to the genera. He compiled a 'Provisional Host Index of United States Fungi' (1888-91), and along with Seymour edited the 'Bibliographical Index of North American Fungi' (1905). He had also prepared and printed plates for a work on fleshy fungi, which has been left uncompleted.

Professor Farlow was intimately associated with British workers, and when the 'Annals of Botany' was founded he at once accepted the post of American editor. He did much to maintain friendly relations between the botanists of English-speaking countries. Among the many honours awarded to him were the Foreign Fellowship of the Linnean Society (1892) and the Honorary Degree of LL.D. of Glasgow University (1910). [A. L. SMITH.]

ERNST HEINRICH PHILIPP AUGUST HAECKEL was born at Potsdam in 1834. He came of a long line of legal families on both sides. Before he was a year old, his father, a Government law official, was transferred to Merseburg, in Saxony, and there all his school-days were passed. Before they were over, however, his father had retired from Government service and removed with his family to Berlin.

As a child he showed the love for nature and the fondness for drawing which were intensified as he grew older. Botany was his first love, and it is interesting to read that as a boy of eleven he spent a whole day on the Siebengebirge, hunting for *Erica cinerea*. At about this age he began to form an herbarium, and made a fruitless effort to determine and distinguish the "good and bad species" of willows and blackberries. In his school holidays he met Schleiden in Berlin, and was much attracted to and influenced by him. Schleiden was Professor of Botany at Jena, and the young Haeckel visited him there, and made arrangements for a course of botanical study. After his final school examinations were passed he went to Jena, but his stay and botanical studies were cut short, owing to a bad attack of rheumatism, the result of searching for *Scilla bifolia* in the damp meadows of Saale on a cold March day. He had to go home to Berlin to be nursed, and did not see Jena again for many a long day.

Haeckel worked at botany under Braun in Berlin, but his father could not look upon scientific research as a calling, so to please his father he went in 1852 to Würzburg as a medical student. Here he came under the influence of Kölliker, Virchow, and Leydig, and here, too, he came in contact with Gegenbaur, who had recently returned from Messina, where, along with Kölliker, he had been working on Medusæ. Gegenbaur's account of the work done at Messina and the wonders of marine life so enthralled the young and enthusiastic Haeckel that he resolved to go there and do likewise on the first opportunity. In 1854 he returned to Berlin, and for a year or more worked at zoology under Johannes Müller, who took him to Heligoland to study

marine animals. Haeckel had many great teachers, but Johannes Müller influenced him more than any of them.

In 1855 Haeckel returned to Würzburg to get on with his medical studies, much against his inclination, but in 1856 he managed to get to Nice along with Kölliker and others for further marine investigations. He afterwards returned home to Berlin to prepare his dissertation for the doctorate, which was on a piece of zoological work, 'De telis quibusdam Astaci fluviatilis.' On obtaining his degree he was sent by his father to Vienna—a safe distance from the sea—where he walked the hospitals, and managed to pass the State examination in Medicine in 1858. He was now qualified to practise, and he settled in Berlin so as to have access to Johannes Müller's laboratory. Unfortunately, Müller's sudden death upset all Haeckel's plans, but he began to practise, and not wanting to be disturbed in his zoological work by too many patients, he fixed his consulting hours from 5 to 6 A.M.! The result was that during a whole year he had only three patients, and none of them died. "This success was enough for my dear father," says Haeckel, and the old man consented to his son having one more year to seriously study marine animals. Early in 1859 Haeckel reached Italy, travelling slowly and sketching as he went along. He reached Sicily in the autumn, and settled down at Messina for six months to the study of the Radiolaria. On this journey he discovered his talent for landscape painting, and was nearly diverted from zoology to live the life of an artist.

In 1861 Haeckel was still depending on allowances from his father, and something had to be done; so he went to Jena to see his old friend Gegenbaur, who was now occupying the Chair of Zoology there. By his advice he settled in Jena as a *Privat-docent*. In the following year he was appointed Extraordinary Professor of Zoology, and published his first monograph on the Radiolaria; and in that year, too, he married his cousin Anna Sethe. In 1865 a special Chair of Zoology was founded for him at Jena; and though he received many invitations to fill other Chairs of Zoology, he made Jena his home for the rest of his life.

Haeckel read the 'Origin of Species' in 1860, after his return from Messina, in a German translation by Bronn. The book "profoundly moved" him. He was not long in accepting Darwin's views against the immutability of species, and planned the classification of the Radiolaria on lines of evolution, and also constructed a genealogical tree. Haeckel was the first to champion the cause of Darwinism in Germany against the strongest opposition. He became an enthusiastic evolutionist and devotee of Darwinism, which thoroughly permeated all his teaching and all his writings.

In 1864 his wife died, and in order to assuage his grief he wrote his 'Generelle Morphologie' (1866), bearing the sub-title 'General elements of the science of organic forms, mechanically grounded on the theory of descent as reformed by Charles

Darwin.' For general biological classification it inaugurated a new epoch, and Huxley described it as "one of the greatest scientific works ever published." In this work he repeatedly insists on the importance of the "Fundamental Biogenetic Law," which may be briefly stated in his own words, "Ontogeny repeats Phylogeny." The book did not attract much attention from the general public, so he wrote a *resumé* of a part of it in popular form under the title of 'Natürliche Schöpfungsgeschichte,' and it was a great success. It naturally brought storms about his head, but it also brought him a following apart from that formed by his scientific friends and pupils. An English translation under the editorship of Sir E. Ray Lankester appeared in 1879, under the title of 'The History of Creation.'

In 1866 Haeckel went to the Canaries, visiting England and Darwin at Down on the way. There he worked at the Medusæ, and especially the Siphonophores. It was during this visit that he became interested in Sponges, but it was not until 1872 that his great monograph on the Calcispongiæ was published. In this he formulated his Gastræa-theory, which was really a special application of the Biogenetic law. In subsequent years he elaborated his studies on the Gastræa, and published them in one book in 1877.

In 1867 he married Agnes Huschke, the daughter of the distinguished anatomist at Jena. They had three children, a son who became an artist, and two daughters.

Another large treatise appeared in 1874 under the title of 'Anthropogenie,' and in it Haeckel applied his fundamental Biogenetic law to the evolution of Man. The book is in two parts; the first being on Ontogeny, practically a philosophical text-book on Human Embryology, while in the second part Phylogeny treats of the foundations of Anthropology. (The 5th Edition was translated into English under the title of 'The Evolution of Man,' 1905.) After giving an account of the evolution of the various tissues and organs of Man's body, he goes on to the evolution of Man's soul, the psychic organ being the brain. "The human soul or psyche, as a function of the medullary tube, has developed along with it; and just as brain and spinal cord now develop from the simple medullary tube in every human individual, so the human mind or the psychic life of the whole human race has been gradually evolved from the lower vertebrate soul." Logically, therefore, both proceed from the very primitive soul of Man's Protozoon ancestors. In 1876 he published a short essay, 'Die Perigenesis der Plastidule.' This is one of his most remarkable pieces of work. Hering in 1870 had shown that memory must be considered a general function of organic matter, and that reproduction and inheritance can only be explained by admitting the existence of this unconscious memory. In the above mentioned essay Haeckel elaborated this idea. He resolved cells into plastidules (molecules), and applied the physical principle of transmitted motion to them. In his own words: "I concluded

that Heredity is the memory of the plastidules and variability their power of comprehension." This work was followed in 1878 by 'Cell-Souls and Soul-Cells' and other essays on Evolution.

In 1879 Haeckel published his 'System der Medusen,' a large folio work, comprising not only his own researches, but those of all others who had gone before him. On the return of the 'Challenger' Expedition he received from the British Government the collections of Radiolaria, Keratosa, Siphonophora, and Medusæ. In the Report on the Siphonophora the opportunity was taken to include the results of his visit to Ceylon and other places, and most of the beautiful figures which illustrate the specimens were drawn from life by him. In judging Haeckel's systematic work it is necessary to bear in mind that he was a man who possessed a very fertile imagination, an artistic temperament, and a great keenness for Evolution. In all his monographs he drew up new classifications based upon Evolution, and once he got his imaginary scheme completed, then it was only a question of making the species fit into it. He was an expert at reconstructing an animal out of a fragment, and it was wonderful, when finished, how well it fitted into his classification. A previously described species that would spoil or interfere with his system of classification received an amended description, owing to its author, as Haeckel considered, having overlooked the essential characters which were wanted. Haeckel's strong imaginative powers and his enthusiasm for Evolution were against him as a good systematic zoologist. He was too fond of reconstructing imaginary species out of bad material to fit his views on Evolution, and under the influence of his artistic temperament the pencil would tend to convert ugly things into beautiful ones. It was not deliberately done, but his enthusiasm for Evolution and Art led him astray. The climax in monographs was reached with the 'Challenger' Radiolaria (1887). The text consisted of 2700 pages and the figures covered 140 plates. Over 3000 new species were described.

In 1881 Haeckel went to Ceylon for a few months with all the outfits of a marine zoologist, botanist, photographer, and artist. This trip he thoroughly enjoyed, and he gave an interesting account of his work and experiences in a book translated under the title of 'A Visit to Ceylon.' In subsequent years he visited most of the countries in Europe, Italy being his favourite, appealing most to his artistic tastes. He also made expeditions to North Africa, Asia Minor, Red Sea, and the East Indies. As he grew older his love for painting was more indulged in on his travels, for he could not resist painting, either in oil- or water-colours, a landscape that held him in enchantment, any more than collecting animals and plants for his museum.

On the completion of the 'Challenger' monographs Haeckel practically gave up systematic work and turned his attention more closely to his works on Evolution and his philosophy of Monism, in which he acknowledges nothing supernatural, but conceives a God who embraces Nature and at the same time is

one with Nature, organic and inorganic. A great work, 'Die Systematische Phylogenie,' appeared in 1894-96. It was a sketch of a natural system of organisms on the basis of their stem-history, and dealing with the Protists, plants and animals. In the 'Riddle of the Universe' he published a popular study of his Monistic philosophy, and the book had an immense sale, being translated into over a dozen different languages. It was followed by a supplementary volume, 'The Wonders of Life.' Haeckel was a firm believer in the Inheritance of Acquired Characters, and regarded it as "one of the most important principles in evolutionary science." He was consequently a strong opponent of Weismann's theory of the Continuity of the Germ-plasm, and not a supporter of De Vries's Mutation-theory.

He was an adept at coining names, usually derived from Greek, for use in his systematic classification and for text-books. To him zoologists are indebted for many words now in common use, such as:--Ontogeny, Phylum, Protozoa, Protista, Metazoa, Plankton, Coelom, and Gastrula.

It is impossible within the limits of an obituary notice to give more than a brief outline of Haeckel's activities, for he was a prodigious and vigorous worker. Students flocked to his classrooms at Jena, and his courses of semi-popular lectures on Evolution were fully attended by all sorts and conditions of people, from far and near. In the prime of life he was a fine, handsome man, with a strong but charming personality, fearless in expressing his Evolutionary views, which were by no means favourably received by the multitude, and attempts were even made to eject him from his Chair of Zoology.

At the time of the outbreak of the Great War, Haeckel had reached the age of eighty, and was resting, with the infirmities of old age upon him, after the labours of his long and strenuous life. The fact that Britain honoured her treaty with Belgium and declared war upon his Fatherland aroused into activity his latent Prussian Soul-cells, and he attacked England, with his pen, with more bitterness and hatred than he ever did his strongest opponents on Evolution and Monism. This eruption may be passed over and put down to "Senility," for it was against his later years' motto: "The good, the true, and the beautiful, are the ideals, yea the gods, of our Monistic philosophy"; and besides he had many old friends in England, and had received most of the honours that she could give him, including the Honorary Foreign Membership of the Linnean Society and its Gold Medal. He lived to see the end of the war, and, after a prolonged illness, died in his beloved town of Jena on 8th August, 1919, at the age of 85. [E. T. BROWNE.]

JOHN HOPKINSON was born at Leeds on the 15th November, 1844; his father and uncle having recently and successfully established the firm of J. & J. Hopkinson, pianoforte makers, transferred it in 1846 to London, whither in 1856 the whole

family migrated. The subject of this notice first went to a day-school in London, and later to a boarding-school at Berkhamsted. Here it was, when 15 years old, he began to show a bent towards science, amongst other things collecting plants, and displaying so keen a liking for botany, that when some years afterwards his old schoolmaster was about to leave England he gave his herbarium, containing many specimens collected by the Rev. C. A. Johns, to his former pupil.

In 1860, at the age of 16, John Hopkinson passed direct from school to his father's business, and remained in its active prosecution for 53 years; during this long period his evenings were given up to scientific pursuits. The first society he joined was that of the Geologists' Association in 1865; two years later the Royal Microscopical Society, and in 1869 the Geological Society of London. It was in 1868 that he read his first paper on British Graptolites before the Quekett Club; the subject took up much of his attention for several years, until the claims of administration of a local society obliged him to concentrate his attention upon the latter. In 1874 he removed to Watford, and in the late autumn of that year, in conjunction with Dr. Alfred T. Brett and Mr. Arthur T. Cottam, a preliminary meeting of local naturalists was held, leading in January 1875 to the establishment of the Watford Natural History Society, with Mr. John Evans (afterwards knighted) as the first president and Mr. Hopkinson as secretary, librarian, and editor; the last-named office he retained to the closing day of his life.

He was elected into the Linnean Society on the 18th February, 1875, and served on the Council from 1908 till 1911. As the years passed on, he came to use the library more extensively, and in recent times he was in our rooms several times each week, largely for the volumes issued by the Ray Society.

In 1877, he married Miss Katherine Willshin, of St. Albans, who survives him, with two married daughters.

In 1879 the Watford Natural History Society enlarged its scope and changed its name to the present one, The Hertfordshire Natural History Society, of which renamed society Mr. Hopkinson remained the active and energetic officer to the end of his life. In the same year, at the British Association meeting at Sheffield, he urged that an annual conference of delegates of various provincial societies should take place, and the originator of the plan presided over the first conference, which was held at Swansea the following year. These gatherings were at first not officially recognised, but they now form a part of the programme at each meeting of the Association.

Another suggestion which took some years to develop was that of a local museum at St. Albans; in 1896 a temporary building was opened and the new permanent one the next year. In 1900 Mr. Hopkinson transferred the greater number of his meteorological instruments to the museum, together with his herbarium (previously mentioned), his local collection of mollusca and

his fossils, except a special selection of graptolites which he gave to the Woodwardian Museum, Cambridge. At this time he left St. Albans and settled again at Watford in the house built by his father, which was his home to the end.

The affairs of the Ray Society became of increasing interest to Mr. Hopkinson; in 1889 he became a member of the Council, in 1899 the treasurer, and in 1902, upon the death of the Rev. Thomas Wiltshire, its secretary and centre of its activities.

In 1913 he retired from business, when his firm was turned into a company, remaining on the board as a director; from this time he was free to employ his full time in the service of the two societies so dear to him. During the war he was compelled to relinquish evening meetings as, owing to the reduced lighting and his own extreme short-sight, he was handicapped in walking.

To the last our late Fellow was alert and vigorous, and probably his last visit to any of the societies to which he belonged was to our Society on the afternoon of Friday, July 4th, 1919, when he discussed a point of administration of the Ray Society; a few hours later he was dead of heart failure, early on the morning of the 5th July, leaving a gap in the band of earnest naturalists not easily to be filled. He was buried on Thursday afternoon, 10th July, at Watford Cemetery, Mr. Charles Oldham and Mr. Wilfred Mark Webb representing the Linnean Society.

[B. D. J.]

The ranks of critical British botanists have sustained a severe loss by the unexpected death of the Rev. EDWARD SHEARBURN MARSHALL on the 25th November, 1919.

Born in Park Lane on the 7th March, 1858, our late Fellow was privately educated in England and Germany, entering Marlborough College in September 1873, where he remained nearly four years, obtaining an Old Marlburian Scholarship (1876) the year after he left, an Exhibition, and a Scholarship at Brasenose College, Oxford. At the University he took a Second Class in Classical Moderations in 1879 and a Third Class in History in 1881, the year he graduated B.A., proceeding M.A. in 1884. He was at Wells Theological College in 1882, ordained deacon in 1883, and priest in 1885, the Marlborough Mission at Tottenham supplying his title to orders.

From this curacy he moved to another at Witley, Surrey, and whilst there he married on 16th August, 1887, Fanny Isabel Foster, a niece of Birket Foster, the water-colour artist. In 1890 he became Vicar of Milford, where he stayed ten years; from 1900-02 he was Curate-in-charge of Lavington-cum-Graffham, Sussex, then Vicar of Keevil in Wiltshire, and in 1904 he became Rector of West Monkton, his last clerical post.

He had complained for some years of fits of depression, which increased in intensity and frequency; in the middle of 1918 he suffered from a nervous breakdown, even fainting in the pulpit. Acting on medical advice, he made arrangements for withdrawing

from pastoral work, and in 1919 he bought an estate at Tidenham, near Chepstow, naming it 'Offa's Dyke.' It was hoped that the release from parish work would relieve the depression, but family cares deepened the gloom; the loss of his only brother, due to an accident, followed by the illness and death of his wife, and doubts about his policy in having bought a large estate with possible financial trouble—a purely imaginary trouble—resulted in his being found dead in his room on the 25th November, due to the action of poison.

Although our late Fellow was at Marlborough at the time when the Rev. T. A. Preston (1833-1905) was active as a naturalist in the School (Proc. Linn. Soc. 1904-05, pp. 49-50), it is practically certain that his attraction to botany was acquired at Oxford. His first contribution was a modest paragraph in the 'Journal of Botany' for 1885, on *Pinguicula alpina* in Scotland, the first of a series of articles in the same journal which amounted to 246, extending over thirty volumes of that serial, and embracing reviews, catalogues of plants observed in various parts of the kingdom, as well as critical remarks on such genera as *Epilobium*, *Carex*, and the like.

The chief contribution to the botany of his native land was his carrying through the publication in 1899 of the 'Flora of Kent,' which had been in progress in the hands of Mr. F. J. Hanbury since 1872; to the same pen is due the summary of the Kentish Flora which appeared in the Victoria History of the County (1908); the 'Supplement to the Flora of Somerset' was undertaken at the instance of the Somersetshire Natural History Society; it came out in 1914; the account of the genus *Betula* in the Cambridge 'British Flora' was due to him; and many contributions to the works of others were written by him. His critical acquaintance of British plants led to his being constantly appealed to for decisions on doubtful forms, and besides the articles in the 'Journal of Botany' already mentioned, he contributed much to the reports of the two Exchange Clubs, of which he was an active member almost to the last.

Two plants were named after him, *Hieracium Marshalli*, E. F. Linton, and *Rubus Marshalli*, Focke & Rogers; another *Hieracium* was named by him in honour of his wife, *H. Isabella*.

For the above account the writer has to acknowledge his indebtedness to the Editor of the 'Journal of Botany,' where in the first number of the present year (1920) appears a sympathetic and detailed review of the lifework of our late Fellow, accompanied by portraits of husband and wife. [B. D. J.]

The Rt. Hon. ALEXANDER PECKOVER, Baron PECKOVER, was born at Wisbech 16th August, 1830, and was directly descended from Edmund Peckover, a trooper in Cromwell's army, and whose landed estate at Fakenham, Norfolk, he possessed. He was educated at Grove House School, Tottenham, and became a partner in the bank of Gurney, Peckover & Co., of Wisbech,



in which he spent his business life. In 1907 he was created Baron Peckover, a title which lapsed on the death of the first holder, as three daughters but no son formed his family; his wife, the only daughter of J. Sharples, of Hitchin, whom he married in 1858, died in 1862. From 1893 to 1906 he was Lord Lieutenant of Cambridgeshire, the first instance of a member of the Society of Friends filling such a post. He delighted in collecting ancient manuscripts, early bibles, and maps, amassing a splendid library, and in early life he was devoted to chess, cricket, and tennis. He died at Bank House, Wisbech, on the 21st October, 1919.

[B. D. J.]

Professor MAGNUS GUSTAF RETZIUS, whose death at the age of 77 occurred at Stockholm on 21st July, 1919, was one of the most distinguished zoologists Sweden has produced. Born at Stockholm 17th October, 1842, and descended from a grandfather who was Professor of Natural History at Lund, and a father who was Professor of Anatomy at Stockholm, he doubtless developed his remarkable scientific gifts in a congenial environment. His work ranged over a wide field, and soon won him recognition as an authority on such diverse subjects as histology and anthropology. In conjunction with Prof. Axel Key, he wrote in 1875 a standard work on the cerebro-spinal membranes and spaces, and later brought out a series of monographs on the internal ear, the microscopic structure of the nervous system and sense organs of various animals, the structure of spermatozoa and nuclei—all illustrated with a magnificence which has never been surpassed. Important work was also published by him on the brain of Man and of anthropoids. Retzius did much to forward the study of anthropology in Sweden, and his 'Atlas of ancient Swedish skulls' (1900) and 'Anthropology of Sweden,' written along with Prof. Karl Fürst (1902), are contributions of permanent value. Some of his conclusions were given in his Huxley Lecture delivered in this country.

He was elected a Foreign Member of the Linnean Society on the 6th May, 1909, and of the Royal Society in 1907; he also received the honorary degree of Sc.D. at Cambridge, and at many Continental universities a similar degree in the faculties of medicine and philosophy.

[E. S. G.]

SIMON SCHWENDENER, who was elected a Foreign Member of the Linnean Society in 1884, was born at Buchs, in the Canton of St. Gallen, Switzerland, on 10th February, 1829. His father was a farmer, but the son early evinced an inclination for scientific rather than for agricultural pursuits. On leaving school he qualified as a teacher in the elementary school of his native town. A University education seems to have been, at first, beyond his means, but a bequest from his grandfather made it eventually possible. He began his University career at Geneva, studying botany under Alphonse de Candolle, but it was soon interrupted

by the exhaustion of his resources, which involved a return to school-teaching. However, in 1856, he was in a position to remove to Zürich to resume botanical work under Oswald Heer, and in that year he graduated with a phænological thesis, 'Ueber die periodischen Erscheinungen der Natur, insbesondere der Pflanzenwelt,' which he had begun at Geneva.

Schwendener soon came into relation with Naegeli, who had recently moved to Zürich from Freiburg i./B., and with his assistance began the study of the microscopical anatomy of plants. The result was that when Naegeli was called to the Professorship of Botany at Munich (1857), Schwendener accompanied him as his assistant. After ten years at Munich, Schwendener was appointed Professor of Botany at Basel: ten years later (1877) he moved on to Tübingen, where he succeeded Hofmeister; and in 1879, on the death of Alexander Braun, he became Professor of Botany at Berlin, where he spent the remainder of his life. He died on 27th May, 1919. He was never married.

His first considerable work was 'Das Mikroskop,' written in collaboration with Naegeli, published 1865-7 (2nd edn. 1877), a book which contributed materially to the development of modern Botany. Schwendener was especially responsible for the part of it dealing with the mechanism and the optical theory of the microscope; he discharged his responsibility with conspicuous success that showed the natural bent of his mind to the mathematical. As a matter of fact, Schwendener was not a naturalist, and was rather contemptuous of systematic Botany and field-work. However, at this period he was actually engaged upon a piece of definitely botanical work, investigating the structure of Lichens, the results of which were published in Naegeli's 'Beiträge zur wissenschaftlichen Botanik,' 1860-3-8. At that time much interest was being taken in the nature of the coloured cells containing chlorophyll, known as "gonidia," which are a constituent of the Lichen-thallus. The resemblance of these gonidia to free-living organisms considered to be Algæ was recognised, and the prevalent view was that these so-called Algæ were merely Lichen-gonidia which had escaped from the thallus and continued to live as free organisms. The conjecture had been hazarded that the facts could be interpreted in precisely the opposite way: that the gonidia are really Algæ which have become enclosed by and imprisoned in the colourless filamentous tissue of the growing Lichen-thallus. Schwendener was led by his observations to adopt and support the latter view. In 1869 he published his celebrated work, 'Die Algentypen der Flechtengonidien,' in which he adduced convincing evidence that the gonidia do not originate in the thallus, but are Algæ which have become invested or invaded by the mycelium of a Fungus. This led on to the striking inference that a Lichen is not a simple organism, but is composite, consisting of Algæ and Fungus living together in a relation which, on the whole, is one of mutual advantage—an altogether new biological conception which de Bary termed

“symbiosis.” The passionate opposition of the professed lichenologists was aroused, a veritable “odium lichenologicum” prevailed, and even now the controversy has not altogether died out. However, the more the actual facts are investigated, the stronger becomes the position of the Schwendenerian theory, which is now almost universally accepted.

Schwendener's contribution to the right understanding of Lichens is his first claim to remembrance as a botanist. His second claim is that he founded and prosecuted, to some extent, the study of physiological anatomy. After 1870, his research was confined to the study of the anatomy of plants in relation to function. Whilst at Basel he published two important works, in which the application of mechanical principles to explain the structure and development of plants was the prominent feature. The first was ‘Das mechanische Prinzip im anatomischen Bau der Monokotylen’ (1874), in which it was shown that the distribution of the supporting-tissue (stercom) in these plants is in accordance with recognised principles of constructive engineering. The second was ‘Die mechanische Theorie der Blattstellungen’ (1877), in which he discussed the relation between the various forms of phyllotaxis and the mechanical conditions under which the leaves are developed.

During his Berlin-period, Schwendener published, mostly in the ‘Monatsberichte’ of the Prussian Academy, a number of papers on various physico-physiological subjects, such as the twining of stems, the ascent of sap, the mechanism of the stomata and of the pulvini of leaves, etc. He inspired a number of his students to pursue research in the direction of physiological anatomy, of whom Professor G. Haberlandt, now his successor at Berlin, is the most famous.

[S. H. VINES.]

SIR PETER WYATT SQUIRE, born on 6th February, 1847, the son of Peter Squire, was educated at King's College School, and entered his father's business of pharmaceutical chemist. His publications were chiefly concerned with pharmacy, but in 1867 he was appointed chemist on the medical staff of the Royal Household. For his services in this appointment for more than fifty years he was knighted in June 1919.

His great recreation was punting, and he wrote the section on that sport in the Badminton Library. He died at his house, ‘The Ryepeck,’ at Shepperton, on the 17th September, 1919; his election as Fellow of our Society dated from the 1st November, 1877.

[B. D. J.]

JAMES WILLIAM HELENUS TRAIL was born at Birsay, Orkney, on the 4th March, 1851, the youngest son of the Very Rev. Samuel Trail, minister of Birsay and Harray, afterwards Professor of Systematic Theology at Aberdeen 1867–87, and Moderator of the General Assembly of the Church of Scotland in 1874.

His early education was carried out at home, Tulloch's private school, and the Grammar School of Old Aberdeen, where, owing to the extreme classical drill there prevalent, he took a violent dislike to the classics. As a child he had been accustomed to the observation and collection of natural objects, which tendency had been encouraged at Tulloch's school, and this proclivity was continued after his entrance into the University in 1866; here he did not seek distinction in classics, mathematics, or philosophy, concentrating his attention in the natural science department, obtaining highest honours when he graduated M.A. in 1870.

At that time the medical faculty provided the only avenue offered by the University for the student desirous of following science, and Trail was not specially drawn to his purely professional studies; but he served in 1870-73 as assistant to the professors of botany and chemistry and to the curator of the zoological museum. In 1873 he interrupted his medical career by accepting the position of naturalist to a South American exploring expedition, and was thus able to travel more than 16,000 miles on the Amazon and its northern tributaries, making full notes and collecting both plants and animals. On his return in 1875 he resumed his medical studies and set about the arrangement and publication of his results. In the following year he graduated M.B. with highest academical honours.

He was chosen in the same year (1876) to fill the post of botanist in British Guiana, but in 1877, when about to take up his duties, Dr. G. Dickie resigned his Chair, and Trail was appointed by the Crown to succeed him, beginning his career as Professor of Botany in May. The Chair of Zoology fell vacant in 1878, and Trail deputed for the new occupant during 1878-79 with signal success.

On taking up his new duties Trail found the equipment of the botanical department very defective. By 1879, when he proceeded to the degree of M.D., he had formed his plan and begun to carry it out, until he left for his successor an excellent teaching museum, laboratories, and a botanical garden.

From 1871 onwards Trail had published papers on galls in the 'Scottish Naturalist,' and in 1883 Dr. Buchanan White resigned its editorship and persuaded Trail to take over the duties from 1884, until it was merged, in 1892, in the 'Annals of Scottish Natural History,' and he acted as botanical editor during the twenty years that the 'Annals' were published.

The year 1886 witnessed Trail's part in the foundation of the Aberdeen Working Men's Natural History Society, frequently guiding its discussions and sometimes taking the lead in its excursions; this help was acknowledged by the Society annually electing him its president.

In 1891 the University Commissioners required a report on the condition of the library. Trail, who had served continuously on the library committee since 1877, was constituted curator of the library and chairman of the committee, and to draft the report;

he succeeded so well that he was annually re-elected to both posts. In 1892 he was appointed Dean of the newly-established Faculty of Science; the year following he was elected F.R.S.

The year 1895 laid another duty upon the professor: his friend Buchanan White had died, leaving his MS. 'Flora of Perthshire' advanced, but not finished for publication; Trail undertook the task, and with the help of friends accomplished it by 1898. The College of Agriculture was founded in 1903, Trail having taken a prominent part in the preliminary arrangements; he was also president of the Buchan Field Club till 1904, when he retired.

The last ten years of his life were spent in gathering and arranging materials for a projected 'Flora of North-Eastern Scotland' on a wide basis. After 1913 the strain of war conditions prevented his usual visits to London, and with the cessation of the war, the sudden increase of students involved the professor in extra exertions. After a short illness, due to a duodenal ulcer, his strength failed, and he passed away on the 18th September, 1919, aged 68.

Trail founded three funds:—1. In memory of his mother to assist undergraduates in any of the faculties who may display approved proficiency in Natural History studies. 2. On completing a quarter of a century's service as curator of the University library, for use in supplement of regular grants from the University exchequer, for the purchase of scientific books. 3. The third fund which especially affects this Society, in 1909, a sum "for encouragement on researches on the nature and properties of protoplasm": see 'Proceedings,' 1908-09, p. 94, with the constitution set out in the 'Proceedings,' 1914-15, pp. 52, 53. This fund was used to provide a bronze medal, which, together with the balance of the fund, is bestowed every five years, the two previous recipients being Prof. E. A. Minchin and Dr. L. Doncaster; the award to be made this year has been allotted to Dame Helen Gwynne-Vaughan, D.Sc., F.L.S.

For the facts recorded in the foregoing lines, the writer has to thank Sir David Prain, C.M.G., C.I.E., F.R.S., for his kind permission to use the obituary printed in the Proc. R. Soc. B. vol. xci. A bibliography of Professor Trail's work will be found in the 'Kew Bulletin,' 1919, pp. 381-388, and 1920, pp. 32, 33.

[B. D. J.]

WILLIAM JAMES TUTCHER was born near Bristol in 1867 and educated at the Merchant Venturers' School in that city; after five years' experience in private gardens, he came to Kew as a young gardener. In two years he was promoted to sub-foreman and put in charge of the orchids. In 1891 he was appointed assistant to Mr. Charles Ford at Hongkong, and spent nearly thirty years in that island. In due course he succeeded to the post of Superintendent of the Botanical and Forestry Department, and spent most of his spare time in botanical exploration. The year 1912 witnessed the publication of the 'Flora of Kwantung

and Hongkong' by Messrs. S. T. Dunn and W. J. Tutcher, Additional Series x. of the 'Bulletin of Miscellaneous Information,' of the Royal Botanic Gardens, Kew. The herbarium of the department has naturally the bulk of Mr. Tutcher's collected specimens, but duplicates are at Kew and Manila.

The genus *Tutcheria*, Dunn, commemorates our late Fellow, who discriminated the tree in the Hongkong gardens; he himself described *Quercus Elizabethæ* after his wife. He was elected a Fellow of this Society 15th December, 1904, and was looking forward to a holiday at home, when he was attacked by pneumonia, and succumbed in March of the present year, leaving behind a record of successful work and diligent performance of duty. [B. D. J.]

Prof. GEORGE STEPHEN WEST, M.A., D.Sc., A.R.C.S., died at his home, 13 Pakenham Road, Edgbaston, Birmingham, on the 7th August, 1919, at the early age of 43, from pneumonia.

He was born at Bradford in 1876, the second son of his father, Mr. William West, a successful teacher and ardent naturalist. Our late Fellow was educated at Bradford Technical College, the Royal College of Science at South Kensington, and St. John's College, Cambridge; he obtained 1st Class in both parts of the Natural Science Tripos, in 1897 and 1898 respectively, became a Scholar and Hutchinson Research Student at St. John's, and acted as demonstrator in botany in 1899; but here his stay was brief, for in the same year he received the appointment of professor of natural history at the Royal Agricultural College, Cirencester, until 1906. In that year he became lecturer in Botany at the University of Birmingham, then, on the resignation of Prof. W. Hillhouse, he succeeded to the Chair of Botany from 1909 until his death.

His early publications were written in conjunction with his father (1848-1914), as noted in our 'Proceedings' for 1913-14, pp. 65-67. Brought up in an atmosphere of botanic activity, the son of a prominent algologist, the younger West followed in his father's steps, devoting his early attention to freshwater algæ, a subject upon which he became the leading exponent in the United Kingdom, and was pursued to the close of his life. Speaking generally, from 1893 or thereabout, his work was associated with that of his father, until when, a few years before the death of the elder West, whose attention had been increasingly drawn to the ecological study of the bryophytes and lichens, the algological portion of their joint labours became more and more the province of the younger West.

Much of their joint publications appeared in serials and journals, and we may specify the work on the algal flora of Yorkshire (1900-01), the Scottish lochs (1905), Irish lakes (1902-1906), Freshwater Algæ of Burma (1907), English lakes (1909), the Driva Valley in Norway (1910), culminating in the volumes on the British Desmidiaceæ, four volumes published by the Ray Society from 1904 to

1911; six volumes were planned, but the work was hindered, first by a nervous illness of the younger West, which prevented his completing the necessary drawings, and then the war, so that only a preliminary draft or sketch was left, which may possibly be published as a memorial volume at a later date. Our own pages bear witness to their unceasing activity:—In our 'Transactions' appeared the "Freshwater Algæ of Madagascar" (1895), "North American Desmidiæ" (1896), "Freshwater Algæ of Ceylon"—all papers of considerable length, illustrated by many plates, autotyped from the pen drawings of G. S. West. Our Journals contain from the latter, "Variation in Desmids" (1899), Tanganyika results (1907), "Critical Green Algæ" (1908), and "The Plankton of Yan Yean Reservoir" (1909). Shorter papers were printed in the 'Journal of Botany,' three at least, and others in the 'New Phytologist,' 'Journal of the Royal Microscopical Society,' and the 'Journal of the Quekett Microscopical Club.' He was responsible for the account of the freshwater algæ published in the volume edited by Mr. F. Morey in 1909, and with Mr. R. F. Griffith, an account of a giant sulphur bacterium named after his predecessor in the botanic chair at Birmingham, *Hillhousia*.

Two works on his special subject have been issued from the Cambridge University Press: the first, on British Freshwater Algæ, appeared in 1904; the other, on Algæ, simply was the first volume only, the second was to follow it.

Our late Fellow's influence in the University was great; he enjoyed the reputation of being one of the best lecturers at Birmingham, his clearness, conciseness, and admirable method in which he arranged the subjects of his lectures so as to enable his audience to grasp all salient points, and his blackboard diagrams, all joined in rendering his discourses memorable.

Besides his own duties, he served on many committees, including the Board of Agriculture and Fisheries for Staffs, Warwick, and Salop, and the Agricultural College, Studley. He was responsible for planning the grounds of the New University buildings at Bournbrook, Birmingham. He threw himself into the matter of re-afforestation, and personally inspected the plantations and old pit-banks.

His library of algological works and herbarium have been left to the University of Birmingham and his extensive series of drawings to the British Museum (Natural History).

The late Professor married in 1906, and leaves a widow and two children; he was elected a Fellow of the Linnean Society on the 4th April, 1901.

[B. D. J.]

June 3rd, 1920.

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the Anniversary Meeting of the 27th May, 1920, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Dr. Geoffrey Douglas Hale Carpenter, M.B.E., Miss Theodora Lisle Prankerd, B.Sc., Miss Lucy Ellen Cox, B.Sc., and Mr. Harry Bertram Harding were admitted Fellows.

Certificates in favour of the following were read for the second time :—Mr. William Harold Pearsall, M.Sc. (Manch.), Mr. Raymond Alfred Finlayson, Mr. Tom Russell Goddard, and Mr. William Henry Kitching.

Mr. Edmund Gustavus Bloomfield Meade-Waldo, Pyari Mohan Debbarman, B.Sc., Prof. Otto Vernon Darbishire, Ph.D., B.A. (Oxon.), Mr. William Rickatson Dykes, M.A. (Oxon), L.-ès-L. (Paris), Prof. Shankar Purushottam Agharkar, M.A. (Bombay), Ph.D., John Wishart, M.D., D.Sc., Ch.B., Mr. Howard Hamp Crane, Capt. Eric Fitch Daghlish, R.F.A., Ph.D., Mr. Bertram Henry Buxton, and Prof. Otto Rosenheim, Ph.D., were elected Fellows.

The President read from the Chair the following proposed alterations in certain Bye-Laws :—

CHAPTER I. Sect. IV. *Delete* " successive " in line 3 on p. 16.

New Section to follow Chapter I. Sect V. :—

VI. Ballots for the Election of Fellows shall be held at one or more General Meetings of the Society in each Session. The date of such Ballots to be fixed by the Council, and at least one calendar month's notice to be given to every Fellow whose address is known. The Candidates shall be balloted for in the order in which their recommendations were received by the Secretaries, excepting that the Council may propose for Election out of their order and in preference to the others not more than four Candidates in any one year who are distinguished for their knowledge of the Science of Natural History. The Council shall decide as to the number of Ballots to take place at a Meeting, having regard to the number of vacancies at the time.



CHAPTER XVII. Sect. I. *To read*:—

Sect. I. In the printed Proceedings of the Society a record shall be annually made of all Donations of the amount or value of Twenty Pounds and upwards which have been made to the Society during the past twenty years.

The President also announced that he had appointed Mr. E. T. BROWNE, Prof. J. B. FARMER, F.R.S., Mr. HORACE W. MONCKTON, and Mr. R. I. POCKOCK, F.R.S., Vice-Presidents.

It was announced from the Chair that Lady CRISP had offered the gift of an oil-painting by the late JAMES SANT, R.A., of the first admission of Women as Fellows of the Linnean Society, which the Council had accepted; it would remain a permanent reminder of an historic event.

A series of 50 water-colour drawings of the oil-palm, *Elæis guineensis*, by Mr. R. SWAINSON HALL, F.L.S., were lent for exhibition by the Director of the Imperial Institute, Dr. Wyndham R. Dunstan, F.R.S. They were explained by Dr. A. B. Rendle, F.R.S., Sec.L.S.

This was followed by an exhibition by Mr. A. WHITEHEAD, B.Sc., of objects observed in the neighbourhood of Basra, during the war, with lantern-slides of the country and the people, which exhibition was communicated by Mr. H. Findon, F.L.S.

It gave rise to a discussion, in which Dr. A. B. Rendle, Mr. Lester-Garland, Dr. R. J. Tillyard, Prof. W. J. Dakin, and Miss Stephens took part, the exhibitor briefly replying.

Prof. W. J. DAKIN, F.L.S., showed a large series of photographs, as slides in the lantern, of Whaling in the Southern Ocean, giving a detailed description of the operations by a Norwegian association.

Mrs. Rose Haig Thomas, F.L.S., contributed further observations upon a former whaling station in the Hebrides.

June 17th, 1920.

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 3rd June, 1920, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Mr. William Rickatson Dykes, M.A. (Oxon.), L. ès L. (Paris), Mr. Frederick John Freshwater Shaw, B.Sc., John Wishart, M.D., D.Sc., Ch.B., and Dr. Otto Rosenheim, were admitted Fellows.

Mr. George Peddie Miln, J.P., was proposed as a Fellow.

The certificate in favour of Mr. Chintaman Mahader Tembé, F.R.H.S., was read for the second time.

Mr. William Harold Pearsall, M.Sc. (Manch.), Mr. Raymond Alfred Finlayson, Mr. Tom Russell Goddard, and Mr. William Henry Kitching, were elected Fellows.

The President read the proposed alterations in the Bye-Laws Chapters I. and XVII. for the second time.

The following communications in commemoration of Sir JOSEPH BANKS, Bart., P.R.S., the centenary of whose death falls upon the 19th June, 1920, were read as follows:—

1. The General Secretary.—Banks as a Traveller.
2. Dr. A. B. RENDLE, F.R.S., Sec.L.S.—Banks as a Patron of Science.
3. Mr. JAMES BRITTON.—Banks as a Botanist.
4. The President.—Banks as a Trustee of the British Museum of paramount power.

Dr. D. H. Scott, F.R.S., Sir Henry Howarth, F.R.S. (visitor), and Mr. Britton engaged in a discussion on some of the points raised. (See Supplement.)

The communications were supplemented by the exhibition of the following Bauksiana:—

*Shown by the Society:* Letters, books published or patronised by him; an original water-colour drawing, inscribed "The inside of an Iceland House occupied by Sr Joseph Banks during his residence on the Island with several of its Inhabitants, with Sr Jos. Banks & Dr. Solander in the dress they wore drawn in the Island 1772."

*Lent by the Royal Society:* A framed caricature of Sir Joseph Banks, with a monstrous fungus developed in his cellar.

*Lent by Mr. G. W. E. LODER:* engraving by J. R. Smith after the portrait painted by Benjamin West, of Banks in a Tahitian cloak.

*Lent by Mr. G. W. E. LODER:* Mezzotint by Wm. Dickinson after the portrait painted by Joshua Reynolds: with the Horatian

line, *Cras iugens iterabimus acquor*, which gives colour to the belief that this was painted before the failure of the plan to embark on the 'Resolution' in 1772.

[The Society also possesses a holograph of Banks prepared by him as "Hints on the subject of Gardening suggested to the gentlemen who attend the Embassy to China" for Lord Macartney's Embassy in 1792, which was given to the Society in 1823, with a covering letter from Sir George Staunton, stating that it was found amongst the papers of the Embassy.]

June 24th, 1920.

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 17th June, 1920, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Dr. Robin John Tillyard, Mr. James Hornell, and Mr. Walter John Dowson, M.A. (Cantab.), were admitted Fellows.

Mr. Henry Baker Lacey and Miss Ethel Spratt, D.Sc. (Lond.), were proposed as Fellows.

Mr. Chintaman Mahader Temb  was elected a Fellow.

The proposed alterations in the Bye-Laws, which had been read from the Chair on the 3rd and 17th June last, were submitted to a ballot by the Fellows present and adopted.

The General Secretary read a letter received from the Swedish Linnean Society regarding the proposed restoration of the old Botanic Garden at Uppsala with the house in it formerly occupied by Carl von Linn . As the Society is debarred by its Charters from making a direct grant to this praiseworthy object, it can only be effected by private effort, and notwithstanding the numerous demands made at the present time, it is hoped that substantial assistance towards realising this memorial to our eponymous hero will be forthcoming.

Dr. KARL J. F. SKOTTSBERG, Director of the G teborg Botanic Garden, and leader of the Swedish Expedition to Patagonia and

Tierra del Fuego in 1907-09, then gave a lecture on the "Botanical Features of the Juan Fernandez group of islands," and by the help of 70 lantern-slides from photographs taken by himself, gave a graphic account of the flora of the two principal islands, Masatierra and Masafuera, and of a visit to the islet Santa Clara. The views gave a vivid presentation of the extraordinary forms assumed by the water-worn rocks, now existing as ridges between deep cañons.

The President commented on the extreme interest and value of the observations made by Dr. and Mrs. Skottsberg during their six months' stay in the group.

Dr R. J. TILLYARD, F.L.S., then delivered a short lecture on the new Cawthron Institute, of which he has just been appointed Chief of the Biological Department. He stated that the Institute is to be situated in the city of Nelson, N.Z., where the founder, THOMAS CAWTHRON, lived for most of his life. The lecturer gave an account of the early life and adventures of the founder, and showed how he rose from a low estate to become a very wealthy man. In his later years he busied himself with philanthropic enterprises, and on his death it was found that he had left the greater portion of his fortune for the purpose of founding an institute of scientific research. After all claims had been paid, the Cawthron Trust was left with a capital of about £200,000 which, wisely invested, yields an income of about £11,000 a year. Prof. T. H. Easterfield, of Wellington, a chemist of wide repute, has been appointed Director and Chief of the Chemical Department, with Mr. T. H. Rigg, late of Rothampsted, working under him as Agricultural Chemist. In the Biological Department, Miss K. M. Curtis has been appointed Mycologist and Mr. A. Philpott, F.E.S., Assistant Entomologist. The Library and Museum are under the care of the Curator, Mr. W. C. Davies. The activities of the Institute will be directed towards scientific research, both pure and applied, with a view to benefiting the primary industries of New Zealand as a whole and of the Nelson Province in particular.

## ABSTRACTS.

Notes on the Life-history of *Iris Pseudacorus*, Linn., with special reference to its Seeds and Seedlings. (With 1 text-figure.)

By THOMAS ALFRED DYMES, F.L.S.

[Read 19th June, 1919.]

ON 30th November, 1916, I communicated to the Society a note on the seed of *Iris Pseudacorus*, Linn., in which I drew attention to its germination while still afloat, and the difficulty I had experienced in raising seedlings in the open, either on or in mud. On 1st November, 1917, Lt.-Col. J. H. Tull Walsh, L.M.S., F.L.S., communicated the results of his experiments, and exhibited healthy seedlings raised from seeds on or in mud in the open. In 1918 I made a great many experiments to discover why I had failed. That failure was due to too low a temperature, for I kept my mud sowings in cool shade, whereas a comparatively high temperature is necessary for the successful germination of the seeds during their first season. The present communication summarises very briefly the results of these and earlier experiments and observations from 1913 onwards. I need only add that in favourable years, of which 1918 was one, the temperature of the mud and shallows, in which the seeds of this species germinate normally in May and June, frequently rises many degrees above 70° F. during the day, without falling appreciably below it during the night, and for a period sufficiently long to ensure successful germination; that in my cool shade experiments it was generally nearer 60° F., that it never rose as high as 65° F., and that not a single seed produced a seedling, whereas in the higher temperature I was at the same time recording very satisfactory results from a large number of separate sowings under various conditions.

*Iris Pseudacorus*, Linn., is distributed in abundance throughout the British Isles, ascending from sea-level to about 700 feet. Its xerophytic adaptations protect it from some of the dangers of its environment. Protection from animals is afforded by its acrid and astringent secretions, but it is attacked by the larvæ of various insects and molluscs. Domestic ducks eat the seeds and the very young seedlings, and it is almost certain that wild-fowl do so too. *Puccinia Iridis*, DC., is recorded as a fungal foe, and floating seedlings which have failed to strike root sink in the autumn and perish from disease during the winter. An immense amount of observation on the natural enemies has, however, still to be made and is very much to be desired.

In some years, when February is hot and sunny, germination commences in that month, but in others, when the season is cold and dull, not until mid-June; the normal minimum period in nature, commencing in September, when the capsules begin to dehisce, is therefore from five to nine months, according to the season, and usually about seven; the maximum is certainly not

less than twenty. Vegetative propagation is effected by the rhizomes. Plants which I raised in 1916 from floating seedlings, the offspring of seeds harvested in 1915, flowered for the first time in June 1919, at the commencement of their fourth year.

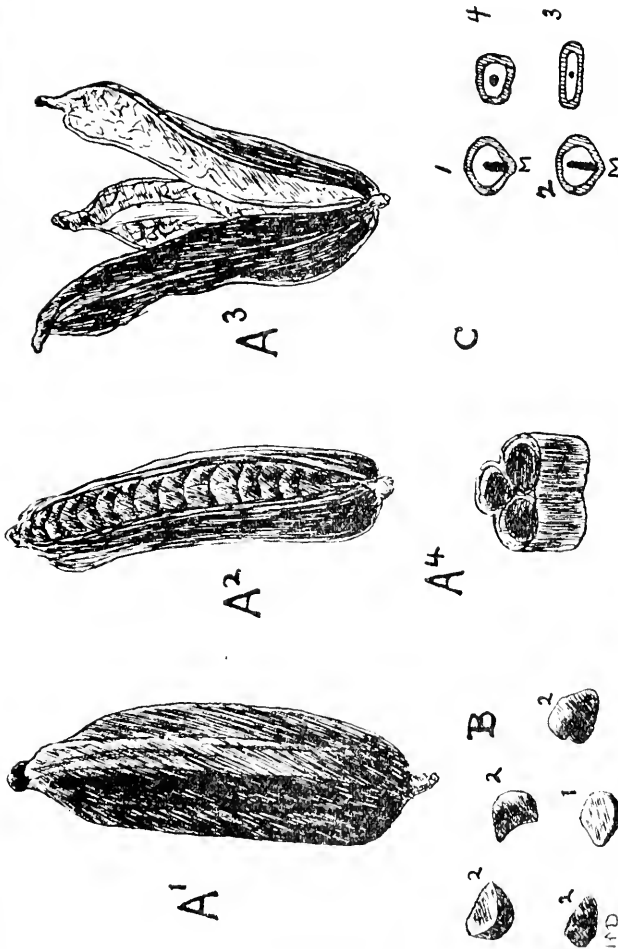
The seeds number from forty or less, to sixty or more, per capsule, and there are sometimes as many as nine good capsules on a spathe. Before maturity the seeds are white and saturated throughout with moisture; the capsule begins to dehisce before the end of September; and then the dry brown testa of the ripe seed is glazed externally, but not internally, and the kernel, which consists of the inner integument, the horny endosperm, and the straight embryo, lies loose within it.

The seeds are carried long distances overland by diving birds, which are the most important of all the dispersal agents, and I think it quite probable that the altitudinal range in this country is dependent to some extent upon that of the birds that disperse the seeds. The floating seedlings get entangled in the legs of domestic ducks, and are almost certainly dispersed in this way by our native swimming birds. The wind is the least important of the dispersal agents. When the ground around permits, it extends the area of an existing colony outward, but dispersal by the wind alone is practically confined to its blowing the flat seeds a few yards away from the parent plant. In conjunction with dead leaves, however, it is responsible for a good deal of wider, but still local dispersal, and in conjunction with water it blows the floating seeds from one end of a lake or pond to the other. Seeds which have been ice-borne germinate freely, and bits of floating rhizome help to disperse the species since, when stranded on freshwater mud, they reproduce the plants vegetatively. The flat seeds are adapted to dispersal (1) on the backs of diving birds, to which they adhere as the diver rises from below to the surface upon which they are afloat, and (2) by being blown short distances by the wind. In the first event they are useful for founding fresh colonies, often at a great distance, and in the second for extending the area of one already existing. The round seeds, numerically only about one to four of the flat, serve to fill up the death gaps at home and along the margins of running waters.

Sunk seeds possess, while floaters are without, an internal supply of water between the testa and the kernel, which causes them to sink. They yield slightly higher percentages of germination than the floaters. In experimenting, however, one has to make quite sure that the seeds have sunk for this reason, and not merely because of the weight of their superincumbent accretions. Intermittent drought reduces the percentage, and desiccation during the autumn and winter inhibits it almost completely for the first season, except when damage to the testa has let in water to soften the hardened and shrunken endosperm before it is too late.

Dealing for the moment only with first-year seeds—those that are less than a year old—those which are on or at the bottom of shallow water and those which are in, not on, saturated mud,

exposed in either case to hot sunshine, fare the best. The highest percentages of germinations are yielded by floaters and sinkers on or in water one to four inches deep. At greater depths the percentages decrease steadily until at seven inches or more the seedlings produced by sinkers, if any, do not survive; at nine inches none were procured in my experiments.



A. *Capsules*.—1. Immature. 2. Delimiting. 3. Spent. 4. In section, to show a single row of seeds in each loculus.   
 B. *Seeds, whole*.—1. Flat. 2. Round.   
 C. *Seeds in section*, diagrammatic.—1 and 2, Embryo in longitudinal section, M=micropyle. 3 and 4, Embryo in cross section. 1. Embryo before germination. 2. Embryo after plumular germination, but before the extrusion of the radicle. 3. Flat seed with thin anterior and posterior layers of endosperm. 4. Round seed to show the greater thickness of the same layers. All seven-eighths natural size.   
 D. *Seed in section*.

The round floaters germinate more slowly, and yield a lower percentage than the flat floaters, possibly on account of the greater difficulty of plumular irrigation, since in the round the embryo is surrounded on all sides by a thick layer of horny endosperm, whereas in the flat there is hardly any either anteriorly or posteriorly (see text-figure). The round floaters commonly

germinate in a week or more after the flat ones, but with sunk seeds I could detect no such difference, presumably because the internal water-supply had saturated the whole endosperm before the arrival of the time for germination.

Seeds in their second year gave the same general average as those in their first, namely 20 per cent.; thus, taking two years together, 36 seedlings would be the total average yield of every hundred seeds of the harvest of any given year, but more evidence is desirable ament second-year germination. Third-year germination is in all probability never accomplished successfully. I have on several occasions raised sickly weaklings, but none of them have ever lived through the autumn.

Seedlings from seeds which germinated while still afloat among other flotsam can be distinguished readily from those born in mud by possessing a long, branched chlorophyllous radicle, as well as curved and hooked adventitious roots. Securing adequate anchorage is their chief difficulty, which, however, does not trouble the mud seedling, whose seed is buried before germination, especially as the hypogeal cotyledon remains in the endosperm and the hypocotyl is not developed. Seeds in mud, either under water or not, owe their burial to a covering of dead leaves or debris and also to being trodden in by birds and mammals, and it is worth remembering in this connection that dispersal in dead leaves has thus great advantage for the seedling, that worms are always dragging them underground and so burying and anchoring in the soil the seeds that they contain. The radicle being poor in root-hairs, naked seeds or mud without any overlying water fail or succeed according to its hardness. Those on mud under water constantly perish because of its extreme softness, especially when the depth of the water exceeds a few inches; on the other hand, whether under water or not, they are frequently held down by an overlay of debris, and are therefore able to strike root.

The floater is exposed to many and great dangers. It may be carried out to sea only to perish, and if it be solitary upon fresh water clear of debris it is probably doomed; it lies flat, is unable to erect itself or take root, and perishes. If, however, it drifts on to mud it will root readily enough. Floating together or in debris the seedlings erect themselves by the action of the hooked adventitious roots. In my experiments the four or five adventitious roots of the solitary floater did not become either curved or hooked, suggesting that this condition is a useful response to the stimulus of contact. It is interesting to note that the floating seedling, sunk subsequently under 7 inches of water, succeeded, whereas the off-spring of seeds sown at the same depth perished.

The height attained by seedlings from first-year seeds, during their first season up to Christmas, varies from 2 inches in leaf-measurement for the unanchored solitary flat floater to 13 inches in saturated mud; but seedlings from seeds in their second year, sown in saturated mud, produced leaves 19 to 19½ inches long.



It was under conditions which prevail more or less completely at the margins of streams and recently colonised sheets of water that I obtained my highest records of germination, and that is probably Nature's provision against the extreme risks to which the offspring are there exposed.

*Papers consulted.*

- CHAPMAN, T. A.—The Larvæ of *Rhadinocera micans*, Klug, and of *Phymatocera aterrima*, Klug. Entomologists' Monthly Magazine, Series III. Vol. iii. October 1917.
- DYMES, T. A.—A Note on the Seed of *Iris Pseudacorus*, Linn. Proceedings of the Linnean Society of London, 1916-17, p. 6.
- FOWLER, W. W.—Coleoptera of the British Isles. London, 1887-1891.
- GLÜCK, H.—Biologische und Morphologische Untersuchungen über Wasser- und Sumpf-Gewächse. Band iii. Die Uferflora. Jena. (G. Fisher: 1911.) Rev. in Journal of Ecology, vol. i. p. 107. Cambridge.
- GUPPY, H. B.—The River Thames as an Agent in Plant-dispersal. Journal of the Linnean Society of London, Botany, vol. xxix. No. 202. October 1892.
- River Temperature. Parts I. & III. Proceedings of the Royal Physical Society of Edinburgh, vols. xii. & xiii., 1892-4 and 1894-7.
- Water-Plants and their Ways. Science Gossip, n. s., vol. i. September, October, and November, 1894.
- On the Postponement of the Germination of the Seeds of Aquatic Plants. Proceedings of the Royal Physical Society of Edinburgh, vol. xiii., 1894-7.
- The Naturalist in the Pacific. Vol. II. Plant-dispersal. London, 1906.
- Studies in Fruits and Seeds. London, 1912.
- HART, H. C.—Flora of the County Donegal. Dublin and London, 1898.
- KERNER VON MARILAU, A.—The Natural History of Plants, vol. ii. Engl. Trans. London, 1905.
- KIRCHNER, E. O. O.—Flora von Stuttgart. Stuttgart, 1888.
- LEES, F. A.—Flora of West Yorkshire. London, 1888.
- MOSS, C. E.—Vegetation of the Peak District. Cambridge, 1913.
- PLOWRIGHT, C. B.—British Uredineæ and Ustilagineæ. London, 1889.
- RAVN, F. KØLFX.—Om Flydeevnen hos Frøene af vore Vand-hog Sumpplanter. Botanik Tidsskrift, Copenhagen, Bind 19, 1894-5.
- REID, C.—The Origin of the British Flora. London, 1899.
- SCHENCK, H.—Die Biologie der Wassergewächse. Bonn, 1886.
- SERNANDER, R.—Den Skandinaviska vegetationens spridningsbiologi. Upsala, 1901.
- SOUTH, R.—The Moths of the British Isles. Series II. London, 1908.
- TANSLEY, A. G.—Types of British Vegetation. Cambridge, 1901.
- WALSH, J. H. TULL.—The Germination of *Iris Pseudacorus*, Linn., in Normal and Abnormal Conditions. Proceedings of the Linnean Society of London, 1917-18, p. 51.
- WOODRUFFE-PEACOCK, E. A.—Means of Plant-dispersal. Selborne Magazine, vols. xxxviii. & xxxix., 1917 and 1918.

## Plant-sports produced at will.

By Col. H. E. Rawson, C.B., R.E., F.L.S.

[Read 6th November, 1919.]

THE observation that shrubs of Kei-apple (*Aberia caffra*) near Cape Town died when they were deprived of full sun up to a certain altitude in the early morning, led to experiments in screening vegetables at this hour for various periods. The results obtained suggested a system of screening plants at selected intervals of daylight, to which the term "selective screening" was applied. A new variety of *Tropaeolum majus* appeared in consequence, and re-appeared amongst the seedlings in following years which were similarly screened, eventually becoming fixed.

Well-known sports began to appear in *Tropaeolum* plants, such as an increased number of spurs, proliferation, and leaf-division, which also reappeared when the same selective screening was adhered to.

These sports and several new varieties of *T. majus*, as well as many correlated variations, re-appeared in the open garden without selected screening.

The experiments were extended, and a new single form of *Papaver Rhoeas* which was desired was obtained. From this single Poppy a double form appeared which has become fixed.

Sterility was very marked in all cases of sudden changes of colour or structure, indicating that the reproductive organs were affected by selective screening. Proliferation and the transmission through the seed of the changes in colour and structure also point to the organs being influenced during, as well as subsequent to, the action upon the *soma*; while leaf-division, increased spurs, and the correlated variations therewith, prove that the *soma* of the plant has been affected generally by the screening. The intensity of the light regulates and modifies the coloured bands upon all parts of a plant which have been excited by interference.

In nature, selective screening prevails very universally, and these experiments suggest that it deserves to be studied for its power to bring out potentialities which are known to be latent, and to cause correlated variations. Insect-visitors give rise to coloured bands.

Recent American research (5) gives support to the views set out in this abstract.

*References to Literature.*

1. Rawson, Col. H. E.—Sunrise and Growth. Rep. S. Afr. Assoc. 1905 (1907). pp. 251-259.
2. — Colour Changes in Flowers produced by controlling Insolation. Rep. Brit. Assoc., Dublin, 1908 (1909), pp. 902-903.
3. — Variation of Structure and Colour of Flowers under Insolation. *Ibid.* Birmingham, 1913 (1914), pp. 711-713.
4. — Changes of Colour and Structure of Flowers by removing Sunlight at selected hours. London: Journ. R. Hort. Soc. xli. (1915), pp. 42-46.

5. GARNER, W. W., & H. A. ALLARD.—Effect of the relative length of Day and Night and other Factors of the Environment on Growth and Reproduction in Plants. Washington: Journ. Agric. Research, xviii. (1920), pp. 553-606, pls. 64-79.

### The Marsh and Spotted Orchids.

[Read 6th May, 1920.]

MR. E. J. BEDFORD exhibited a series of 30 water-colour drawings, natural size, of the Marsh and Spotted Orchids and their varieties. These were accompanied by a number of detail drawings showing the lips, pollinia, etc. The forms shown included *Orchis incarnata*, L., from Hampshire and West Sussex, with the salmon-pink or flesh-coloured flowers; also a pale pink form with only the slightest trace of markings on the lip: this came from a Middlesex locality.

A form with dull purple flowers and broad lip, leaves bright green and unspotted. This has been known by some botanists as *O. incarnata*, by others as *O. latifolia*, and has recently been named *O. prætermissa* by Dr. G. C. Druce. Specimens of this variety were shown from Middlesex and East Sussex.

Also a form (*O. incarnata*?) with crimson-coloured flowers from Westmorland, and two other varieties from the same locality with similar colouring but wider and flatter lips, sent to the writer as *O. incarnata* var. *pulchella*, Druce.

The Spotted Orchid was represented by three distinct forms. The first, a vigorous plant with dark green heavily spotted leaves, the labellum having a small and narrow centre division and wide side ones; this variety has recently been referred to as *O. maculata*, L., and is usually found in damp situations on heaths or marshes on sandy soils. The second form had similar foliage to the first, but the labellum divided into three equal lobes with the longest in the centre. This is known as var. *trilobata* on the Continent, and has been named *O. Fuchsii* by Dr. Druce.

The third form was that known as *O. erictorum*, Linton, a much less vigorous plant than either of the others, with narrow leaves, and found usually in exposed situations on heaths and sandy soils, often at considerable elevations. All these forms of the Spotted Orchid are from East Sussex.

The following hybrids were shown: *O. incarnata* × *prætermissa*, *O. prætermissa* × *incarnata*, *O. prætermissa* × *Fuchsii*. In the detailed drawings of the lip the examples shown testified to the enormous difference of form and markings assumed by each species, even in those gathered at one time from the same restricted locality. The various forms were also shown by a series of 70 lantern-slides upon the screen, each variety being represented *in situ*; (2) on a larger scale, and (3) enlarged front and side views of the labellum.

## BENEFACTIONS.

LIST in accordance with *Bye-Laws, Chap. XVII. Sect. 1*, of all Donations of the amount or value of Twenty pounds and upwards, received during the past Twenty years.

## 1901.

Hon. Charles Ellis, Hon. Walter Rothschild, Frank Crisp, Esq., F. D. Godman, Esq., and the Bentham Trustees: The Correspondence of William Swainson.

Royal Society: Contribution towards Mr. F. Chapman's paper on *Funafuti Foraminifera*, £50.

Prof. E. Ray Lankester: Contribution towards illustration, £30 5s.

Portrait of Dr. St. G. J. Mivart, presented by Mrs. Mivart.

## 1903.

Royal Society: Contribution toward Dr. Elliot Smith's paper, £50.  
Legacy from the late Dr. R. C. A. Prior, £100 free of duty.

Mrs. Sladen: Posthumous Portrait of the late Walter Percy Sladen, by H. T. Wells, R.A.

B. Arthur Bensley, Esq.: Contribution to his paper, £44.

## 1904.

Royal Society: Grant in aid of third volume of the Chinese Flora, £120.

Frank Crisp, Esq. (afterwards Sir Frank Crisp, Bt.): Cost of Supplementary Royal Charter.

The same: Bulliard (P.). *Herbier de la France; Dictionnaire; Histoire des plantes vénéneuses; Champignons*, in 10 vols. Paris, 1750-1812.

## 1905.

Royal Society: First grant in aid of Dr. G. H. Fowler's 'Biscayan Plankton,' £50.

Executors of the late G. B. Buckton, Esq.: Contribution for colouring plates of his paper, £26.

## 1906.

Royal Society: Second grant towards 'Biscayan Plankton,' £50.

Subscription portrait of Prof. S. H. Vines, by Hon. John Collier.

Royal Swedish Academy of Science: Copies of portraits of C. von Linné, after Per Kräft the elder, and A. Roslin, both by Jean Haagen.

## 1907.

- Royal University of Uppsala : Copy by Jean Haagen of portrait of C. v. Linné, by J. H. Scheffel (1739).  
 Royal Society : Third and final grant towards 'Biscayan Plankton,' £50.  
 The Trustees of the Percy Sladen Memorial Fund : First grant towards publication of Mr. Stanley Gardiner's *Researches in the Indian Ocean in H.M.S. 'Sealark,'* £200.

## 1908.

- Prof. Gustaf Retzius : Plaster cast of bust of Carl von Linné, modelled by Walther Runeberg from the portrait by Scheffel (1739) at Linnés Hammarby : the bronze original designed for the façade of the new building for the Royal Academy of Science, Stockholm.  
 Miss Sarah Marianne Silver (afterwards Mrs. Sinclair), F.L.S. : Cabinet formerly belonging to Mr. S. W. Silver, F.L.S.

## 1909.

- The Trustees of the Percy Sladen Memorial Fund : Second grant towards publication of Mr. Stanley Gardiner's *Researches in the Indian Ocean in H.M.S. 'Sealark,'* £200.  
 Prof. James William Helenus Trail, F.R.S., F.L.S. : Gift of £100 in Trust, to encourage Research on the Nature of Proto-plasm.

## 1910.

- Royal Society : Grant towards Dr. G. H. Fowler's paper on Biscayan Ostracoda, £50.  
 Sir Joseph Hooker : Gold watch-chain worn by Robert Brown, and seal with portrait of Carl von Linné by Tassie.  
 Prof. J. S. Gardiner : Payment in aid of illustrations, £35 0s. 6d.  
 Sir Frank Crisp : Donation in Trust for Microscopical Research, £200.  
 The Trustees of the Percy Sladen Memorial Fund : Third grant towards publication of Prof. Stanley Gardiner's *Researches in the Indian Ocean,* £200. (For third volume.)

## 1911.

- The Trustees of the Percy Sladen Memorial Fund : Second Donation towards the publication of the third volume on the *Indian Ocean Researches,* £70.  
 The same : First Donation towards the fourth volume, £130.

## 1912.

- The Indian Government: Contribution towards the illustration of Mr. E. P. Stebbing's paper on Himalayan *Chermes*, £46 15s. 2d.
- The late Mr. Francis Tagart, £500 free of Legacy Duty.
- The late Sir Joseph Dalton Hooker, O.M., G.C.S.I., £100 free of Legacy Duty.
- The Trustees of the Percy Sladen Memorial Fund: Second Donation towards the publication of the fourth volume on the Indian Ocean Researches, £140.
- The same: First Donation towards the fifth volume, £60.

## 1913.

- Royal Society: Grant towards Dr. R. R. Gates's paper on Mutating *Oenotheras*, £60.
- Sir Frank Crisp, Bt., Wallichian Cabinets, £50.
- The Trustees of the Percy Sladen Memorial Fund: Second Donation towards the publication of the fifth volume, £200.

## 1914.

- Royal Society: Grant towards Miss Gibbs's paper on the Flora of British North Borneo, £50.
- Miss Foot: Cost of illustration of her paper on *Euschistus*.
- The Trustees of the Percy Sladen Memorial Fund: Third Donation towards the fifth volume, £10.
- The same: First Donation towards the sixth volume, £190.

## 1915.

- The Trustees of the Percy Sladen Memorial Fund: Second Donation towards the sixth volume, £80.
- Miss Foot: Cost of second paper on *Euschistus*, £32 10s.
- Royal Society: Donations towards the cost of a paper by Mrs. Arber, D.Sc., £40.
- The same: towards paper on Utakwa River plants by Mr. H. N. Ridley, C.M.G., F.R.S., £50.
- Miss Marietta Pallis: Instalment of cost of her paper on *Plav*, £30.
- Thomas Henry Riches, Esq.: Dr. A. R. Wallace's library on Natural History.
- Sir Frank Crisp, Bt.: New shelving for Wallace's Volumes.

## 1916.

- Mr. E. Heron-Allen : Contribution to cost of paper on Foraminifera of N.W. Scotland, £44.
- Messrs. H. Takeda and C. West : Contribution towards the illustration of their paper, £40.
- Royal Society : Contribution towards the illustration of two papers by Prof. Dendy, £40.
- The same : Contribution towards Mr. Swynnerton's paper on Form and Colouring, £70.
- The High Commission for the Union of South Africa, per Dr. J. D. F. Gilchrist, for the illustration of his paper on *Jasus Lalandii*, £30.
- Miss Marietta Pallis : Balance of cost of her paper on *Plav*, £90 16s. 6d.
- Sir Frank Crisp, Bt. : Phototyped copy of Dioscorides from the 'Codex Aniciae Julianae' at Vienna.

## 1917.

- British Ornithologists' Union, etc. : Contribution towards cost of Mr. H. N. Ridley's paper, £20.
- The Royal Society : Second contribution towards the printing of Mr. C. F. M. Swynnerton's paper on Form and Colouring, £75.
- Sir Frank Crisp, Bt. : 'Lindenia,' Ghent, 1891-1901. 17 vols. sm. fol.

## 1919.

- Dr. B. Daydon Jackson : MS. index to Linnean Society's Journal, Botany, vols. xxi.-xl. (1884-1912) and the Botanic entries in the 'Proceedings' for the same period.

## 1920.

- The Royal Society : Third contribution towards the printing of Mr. C. F. M. Swynnerton's paper as above, £50.
- The High Commission for the Union of South Africa, for the printing of Dr. J. D. F. Gilchrist's paper on *Jasus Lalandii*, Part II., £60.

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# ADDITIONS AND DONATIONS

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- Ashby (Edwin).** Notes on Australian Polyplacophora, including Descriptions of Two New Genera, a New Variety, and the Description and Proposed Recognition of Mr. Bednal's *Stenochiton Pilsbryanus*. (Trans. Roy. Soc. S. Australia, xliii.)  
Svo. 1919. **Author.**
- Descriptions of Six New Species of Australian Polyplacophora (Four Acanthochitons and Two Callistochitons), with other Notes. (Trans. Roy. Soc. S. Australia, xliii.)  
Svo. 1919. **Author.**
- A Review of the Genus *Loricella* (Order Polyplacophora), with Notes on Features Previously Unnoted and Description of a New Species. (Trans. Roy. Soc. S. Australia, xliii.)  
Svo. 1919. **Author.**
- Baker (Richard Thomas).** On the Technology and Anatomy of some Silky Oak Timbers. (Journ. Proc. Roy. Soc. N.S.W., lii.)  
Svo. 1919. **Author.**
- Balfour (Andrew).** War against Tropical Disease; being seven Sanitary Sermons addressed to all interested in Tropical Hygiene and Administration. 4to. London, 1920. **Author.**
- Belt (Anthony).** Prehistoric Hastings. (Hastings and E. Sussex Nat. iii.)  
Svo. 1918. **Author.**
- Black (J. M.).** Additions to the Flora of South Australia. No. 15. (Trans. Roy. Soc. S. Australia, xliii.)  
Svo. 1919. **Author.**
- Additions to the Flora of South Australia. No. 16. (Trans. Roy. Soc. S. Australia, xliii.)  
Svo. 1919. **Author.**
- A Revision of the Australian Salicorniæ. (Trans. Roy. Soc. S. Australia, xliii.)  
Svo. 1919. **Author.**
- Blanford (W. T.).** The Fauna of British India, including Ceylon and Burma.  
Svo. London, 1888-1920.
- Coleoptera: Chrysomelidæ (Hispiinæ and Cassidinæ). By S. MAULIK.
- Diptera Brachycera. By E. BRUNETTI.
- Bonaparte (Charles Lucien Jules Laurent).** A Geographical and Comparative List of the Birds of Europe and North America.  
8vo. London, 1838.

- Boring (Alice M.) and Pearl (Raymond).** Sex Studies.—IX. Interstitial Cells in the Reproductive Organs of the Chicken. (*Anat. Recd.* xiii.) 4to. 1917. **Authors.**
- Sex Studies.—XI. Hermaphrodite Birds. (*Journ. Exper. Zool.* 25.) 4to. 1918. **Authors.**
- See **Pearl (Raymond).**
- Bose (Sahay Ram).** Descriptions of Fungi in Bengal. (Agaricaceae and Polyporaceae.) 8vo. **Author.**
- Botanical Abstracts.** Vol. I.→ 4to. *Baltimore*, 1918→
- British Museum (Natural History).**
- British Antarctic ('Terra Nova') Expedition, 1910. Natural History Reports. 4to. 1918.
- Zoology. Vol. II. No. 8. Brachiopoda. By J. WILFRID JACKSON.
- „ Vol. III. No. 6. Arachnida. Pt. I. Araneae. By H. R. HOGG.
- „ Vol. IV. No. 2. *Cephalodiscus*. By W. G. RIDEWOOD.
- „ Vol. V. No. 1. Coelenterata. Part I. Actiniaria. By T. A. STEPHENSON.

## PLANTS.

- Flora of Jamaica, containing descriptions of the Flowering Plants known from the Island. By WILLIAM FAWCETT and ALFRED BARTON RENDLE. Vol. IV. Dicotyledons. Families Leguminosae to Callitrichaceae. 8vo. *London*, 1920.
- A Monograph of the British Lichens. A Descriptive Catalogue of the species in the Department of Botany, British Museum. Part I. (Second Edition). By ANNIE LORRAIN SMITH. Pp. xxiv, 520; with 71 plates. 8vo. *London*, 1918.
- Economic Series :
- No. 8.—Rats and Mice as enemies of Mankind. 8vo. *London*, 1918.
- A map showing the known distribution in England and Wales of the Anopheline Mosquitos, with explanation text and notes. By WILLIAM DICKSON LANG. 8vo. *London*, 1918.
- British Mycological Society.** Transactions, 1896→ 8vo. *Worcester (Cambridge)*, 1896→
- Britton (Nathaniel Lord) and Brown (Hon. Addison).** An Illustrated Flora of the Northern United States, Canada, and the British Possessions from Newfoundland to the Parallel of the Southern Boundary of Virginia, and from the Atlantic Ocean westward to the 102<sup>d</sup> Meridian. 3 vols. 4to. *New York*, 1896–8. *Rev.* G. R. Bullock-Webster.
- Brown (Hon. Addison).** See **Britton (Nathaniel Lord).**
- Brown (Stewardson) and Schäffer (Mrs. Charles).** Alpine Flora of the Canadian Rocky Mountains. 8vo. *New York & London*, 1907. **Harold Russell.**
- Brunetti (E.).** See **Blanford (W. T.).** The Fauna of British India, including Ceylon and Burma. Diptera Brachycera. 8vo. 1920.

- Bullock-Webster** (*Rev. George Russel*). *See Groves* (James).
- Bunbury** (*Sir Charles J. F.*). Botanical Notes at Barton and Mildenhall, Suffolk. Svo. *Mildenhall*, 1889.
- Butler** (*Arthur G.*). Ornithological Papers. Vol. II.  
 CONTENTS:—Are Birds deceitful?; Reason in Birds; Economy and Mice; What is Science?; The Zebra Finch; The Genus *Zosterops*; The European Goldfinch; Egg Markings and Sunlight; The assumption of Summer Plumage in *Pyromelana oryx*; The Imitative Power of Birds; Our British Swallows; Are Birds easily deceived?; Capacity in Nest-Construction; The Poor Wild Birds; The Golden-Crested Wren; Two Rare Tanagers; The Balance of Nature; Development of Pattern in Birds; Ancestral Characters in Nestlings; Colour Change without a Molt; Further notes on Growth of Markings and Colour; A Moot Question; The History of Birds' Nests.  
 Svo. 1915–19.
- Butler** (*E. J.*). Fungi and Disease in Plants.  
 Svo. *Calcutta & Simla*, 1918.
- Cantrill** (*T. C.*). Some Chemical Characters of Ancient Charcoals. (*Arch. Camb.* 1919.) Svo. 1919. Author.
- Caulleury** (*Maurice*) and **Mesnil** (*F.*). "*Xenocoloma brunopti*," C. & M. Copépode parasite de *Polycirrus arenivorus*, C. (*Bull. Biol.* liii.) Svo. *Paris*, 1919. Authors.
- — — Metchnikovellidae et autres protistes parasites des Grégarines d'Annélides. (*Ann. Inst. Pasteur*, xxxiii.)  
 Svo. *Paris*, 1919. Authors.
- Chapman** (*Frederick*). XXII. Palæozoic Worms; with evidence of Soft Parts. (*Proc. Roy. Soc. Vict.* xxxi.)  
 Svo. *Melbourne*, 1919. Author.
- — — XXIII. On some Hydroid Remains of Lower Palæozoic Age from Moregetta, near Lancefield. (*Proc. Roy. Soc. Vict.* xxxi.)  
 Svo. 1919. Author.
- Charborski** (*Gabriela*). Recherches sur les levures thermophiles et cryophiles. (*Univ. Genève*, Thèse No. 627.)  
 Svo. *Genève*, 1918. R. Chodat.
- Chirtoiu** (*Marie*). Observations sur les *Lacistema* et la situation Systématique de ce genre. (*Univ. Genève*, Thèse No. 6103.)  
 Svo. *Genève*, 1918. R. Chodat.
- Chodat** (*Robert*). Un voyage botanique au Paraguay (1914). (*Actes Soc. helv. Sci. nat.* 1917.) Svo. *Berne*, 1917. Author.
- — — CASIMIR DE CANDOLLE, 1836–1918. (*Arch. sci. phys. nat.* (5), 1.)  
 Svo. 1919. Author.
- — — La panachure et les chimères dans le genre *Funkia*. (*C. R. Soc. phys. d'hist. nat. Genève*, 36.)  
 Svo. *Genève*, 1919. Author.
- Christ** (*Hermann*). Die Rosen der Schweiz mit Berücksichtigung der umliegenden Gebiete Mittel- und Süd-Europa's.  
 Svo. *Basel*, 1873. James Groves.

- Christy (Miller).** SAMUEL DALE (1659?–1739), of Braintree, Botanist, and the Dale Family: Some Genealogy and some Portraits. (Essex Nat. 1919.) Svo. 1919.
- On the Arboreal Habits of Field Mice. (Essex Nat. xix.) Svo. 1919. **Author.**
- Hornets, Wasps, and Flies sucking the Sap of Trees. (Essex Nat. xix.) Svo. 1919. **Author.**
- The Ancient Legend as to the Hedgehog carrying Fruits upon its Spines. (Mem. Proc. Man. Lit. Phil. Soc. 63.) Svo. Manchester, 1919. **Author.**
- Church (Arthur Harry).** Elementary notes on Gymnosperms and Angiosperms. With special reference to Forest-types. Svo. Oxford, 1919. **Author.**
- Botanical Memoirs. Nos. 1–5. 4to. Oxford, 1919.
- No. 1. The Building of an Autotropic Flagellate. By A. H. CHURCH.
- .. 2. Gossypium in Pre-Linnean Literature. By H. J. DENHAM.
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- Clarke (J. Jackson).** Rhizopod Protozoa: the cause of Cancer and other diseases. Being Part IV. of 'Protozoa and Disease.' 4to. London, 1915. **Author.**
- Collinge (Walter Edward).** Description of a new Species of Isopoda of the Genus *Paridotea*, Stebbing. (Journ. Zool. Res. ii.) 4to. 1917. **Author.**
- Some remarks upon the occurrence of Two Rare Woodlice in Scotland. (Scottish Nat. 1917.) Svo. 1917. **Author.**
- Contributions to a Knowledge of the Terrestrial Isopoda of Natal. Part I. (Ann. Natal Mus. iii.) Svo. 1917. **Author.**
- *Porcellio ratzeburgii*, a Woodlouse new to the Scottish Fauna. (Scott. Nat. 1917.) Svo. 1917. **Author.**
- Description of a new Species of Isopoda of the Genus *Syniolotea*, Harger, from the Gulf of Manaar. (Reeds. Ind. Mus. xiii. pt. 1.) 4to. Calcutta, 1917. **Author.**
- On the Re-occurrence of *Ligidium hypnorum* (Cuv.) in Great Britain. (Journ. Zool. Res. ii.) 4to. 1917. **Author.**
- Descriptions of some further new varieties of British Woodlice. (Journ. Zool. Res. ii.) 4to. 1917. **Author.**
- Some remarks upon the Terrestrial Isopod, *Porcellio ratzeburgii*, Brandt. (Journ. Zool. Res. iii.) 4to. 1918. **Author.**
- Some Observations upon Two Rare Marine Isopods. (Journ. Zool. Res. iii.) 4to. 1918. **Author.**
- Descriptions of some new varieties of British Woodlice. (Journ. Zool. Res. iii.) 4to. 1918. **Author.**
- A Revised Check-List of the British Terrestrial Isopoda (Woodlice), with Notes. (Journ. Zool. Res. iii.) 4to. 1918. **Author.**

- Collinge (Walter Edward).** The Distribution of Woodlice in Scotland. (Scott. Nat. 1918.) Svo. 1918. **Author.**
- On the Occurrence in Scotland of two rare species of Woodlice. (Scott. Nat. 1918.) Svo. 1918. **Author.**
- Comstock (John Henry).** The Spider Book. 4to. *New York*, 1913.
- Dehaut (E. G.).** Contributions à l'étude de la vie vertébrée insulaire dans la Région Méditerranéenne occidentale et particulièrement en Sardaigne et en Corse. Svo. *Paris*, 1920. **Author.**
- Denham (H. J.).** See **Church (A. H.).** Botanical Memoirs, No. 2.
- De Toni (G. B.).** Notizii bio-bibliografiche intorno Evangelista Quattrami. (Atti R. Ist. Veneto. lxxvii.) Svo. *Venezia*, 1918. **Author.**
- Contributo alla tetratologia del genere "Chrysanthemum" L. (Atti R. Accad. Sci. Torino, liv.) Svo. *Modena*, 1918. **Author.**
- Commemorazione del membro effettivo ENRICO FILIPPO Trois nell' adunanza del 26 Gennaio 1919 del Reale Istituto Veneto di scienze, lettere ed arti. (Atti R. Ist. Veneto, lxxviii.) Svo. *Venezia*, 1919. **Author.**
- Notizii Storiche sulla Fruttificazione del Banano a Modena nel secolo xviii. (Atti Mem. R. Deput. Stor. Patria Prov. Modenesi (v.), xii.) Svo. *Modena*, 1919. **Author.**
- Appunti su GIACINTO CESTONI. (Riv. Stor. Crit. Sci. Med. Nat. x.) Svo. *Sienna*, 1919. **Author.**
- FABIO COLOXNA et l'Eterocarpia (Notizia storica di biologia). (Rev. Biol. i.) Svo. *Roma*, 1919. **Author.**
- De Toni (G. B.) and Tognoli (E.).** Osservazioni botaniche e sperimentali intorno alla *Digitalis lanata*, Ehrh. (Atti R. Ist. Veneto, lxxviii.) Svo. *Venezia*, 1919. **G. B. de Toni.**
- Dixon (H. N.) and Watts (W. Walter).** Mosses. (Austral. Antarctic Exped. Sci. Rpts. ser. c.-vii.) 4to. *Sydney*, 1918. **H. N. Dixon.**
- Donisthorpe (Horace).** The Myrmecophilous Lady-Bird, *Coccinella distincta*, Fald., its Life History and Association with Ants. (Entom. Record, xxxi. & xxxii.) Svo. **Author.**
- Druce (George Claridge).** See **Hayward (Ida M.).**
- Earland (Arthur).** See **Halkyard (Edward).**
- Farwell (Oliver Atkins).** The Identity of Commercial Blue Flags. (Bull. Pharm. 1919.) Svo. *Detroit Mich.*, 1919. **Author.**
- *Panicum lineare*, Linn. (Am. Mid. Nat. vi.) Svo. 1919. **Author.**
- Fawcett (William).** See **British Museum: Plants, Flora of Jamaica.**
- Foot (Katharine) and Strobell (Ella Church).** Cytological Studies. (A Collection of Reprints.) 4to. 1894-1917.

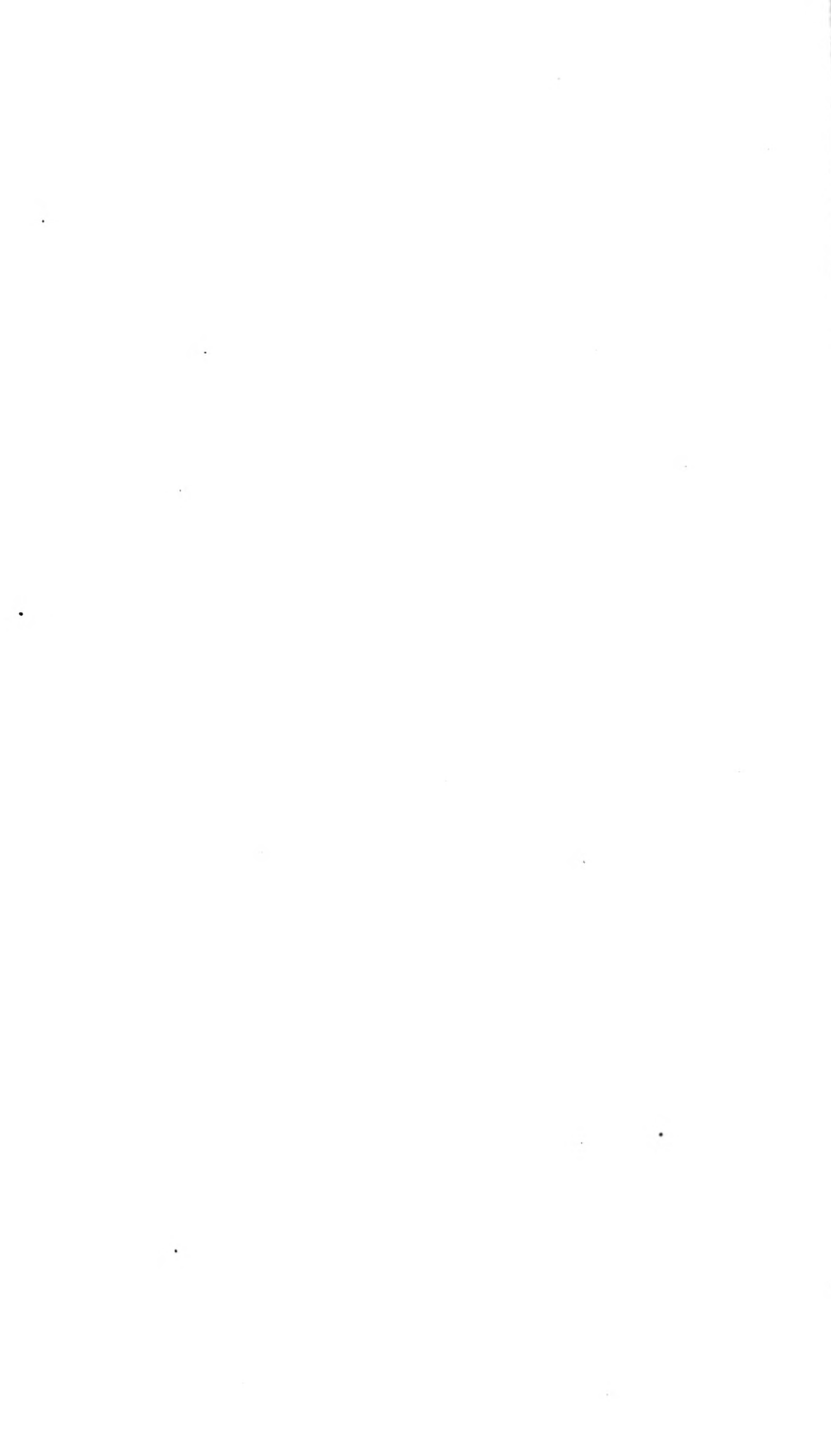
- Groves (James) and Bullock-Webster (Rev. George Russell).** The British Charophyta. Volume I. Nitellæ. (Ray Society.) Svo. London, 1920.
- Halkyard (Edward).** The Fossil Foraminifera of the Blue Marl of the Cote des Basques Biarritz. Edited with Additions by EDWARD HERON-ALLEN, F.L.S., F.G.S., F.R.M.S., and ARTHUR EARLAND, F.R.M.S. (Mem. Proc. Manch. Lit. Phil. Soc. 1917-18.) Svo. Manchester, 1919. **Editors.**
- Hayward (Ida Margaret) and Druce (George Claridge).** The Adventive Flora of Tweedside. Svo. Arbroath, 1919. **Ida M. Hayward.**
- Heape (Walter).** Text-book of Embryology. 2 (3) vols. Vol. I. Invertebrata, by E. W. MACBRIDE. 1914. .. II. Vertebrata, with the exception of Mammalia, by J. GRAHAM KERR. 1919. Svo. London, 1914.
- Henry (Augustine) and Flood (Margaret G.).** The History of the Dunkeld Hybrid Larch, *Larix eurolepis*, with notes on other Hybrid Conifers. (Proc. Roy. Irish Acad. xxxv. Sect. B.) 4to. Dublin, 1919. **Authors.**
- Heron-Allen (Edward).** See **Halkyard (Edward).**
- Herrera (Alphonso L.).** Some Studies in Plasmogenesis. (Journ. Lab. & Clin. Med. St. Louis, iv.) 4to. 1919. **Author.**
- Hertwig (Oscar).** Das Werden der Organismen zur Widerlegung von Darwin's Zufallstheorie durch das Gesetz in der Entwicklung. Svo. Jena, 1918.
- Hutton (William).** See **Lindley (John).**
- [**Jan. Georg.**] Conspectus methodicus testaceorum in collectione mea extantium anno 1830. Svo. pp. 8, carbon print. [Parma, 1830.]
- Janet (Charles).** Sur la Phylogénèse de l'Orthobionte. Svo. Limoges, 1916. **Author.**
- Jardine (Sir William).** The Naturalists' Library. Ornithology. Vol. I. Humming-birds. Svo. Edinburgh, 1833. **Hugh Findon.**
- Jauch (Berthe).** Quelques points de Anatomie et de la biologie des Polygalacées. (Univ. Genève, Thèse No. 609.) Svo. Genève, 1918. **R. Chodat.**
- Kernard (A. S.) and Woodward (B. B.).** On the occurrence in England of *Hygromia oedea* (Locard) [= *Helix limbata*, Drap., 1804, non Da Costa, 1778]. (Proc. Malacol. Soc. xiii.) Svo. 1918. **Authors.**
- — On *Helix revdata*, Britt. auctt. (non Férussac nec Michaud), and the validity of Bellamy's name of *Helix subvirescens* in lieu of it for the British Mollusc. (Proc. Malacol. Soc. xiii.) Svo. 1919. **Authors.**
- — On the first discovery in England of *Helicodonta obroluta* (Müll.). (Proc. Malacol. Soc. xiii.) Svo. 1919. **Authors.**
- — Extracts from some Letters from JOHN BROWN, F.G.S., of Stanway, to S. P. WOODWARD. (Essex Nat. xix.) Svo. 1920. **Authors**

- Kerner (Anton).** *Monographia Pulmonariarum.*  
4to. *Oeniponte*, 1878. **C. C. Lacaita.**
- Kerr (John Graham).** *Text-book of Embryology.* Vol. II.  
Vertebrata with the exception of Mammalia. *See Heape*  
(**Walter**).
- Kirkman (F. B.).** *The British Bird Book. An account of all*  
*the Birds, Nests, and Eggs found in the British Isles.* 4 vols.  
4to. *London & Edinburgh*, 1910-13. **Hugh Findon.**
- Küster (Ernst).** *Pathologische Pflanzenanatomie.* Zweite Auflage.  
Svo. *Jena*, 1916.
- Lillie (Frank Rattray).** *Problems of Fertilization.*  
12mo. *Chicago*, [n. d.].
- Lindley (John) and Hutton (William).** *The Fossil Flora of*  
*Great Britain; or figures and descriptions of the Vegetable*  
*Remains found in a fossil state in this country.* 3 vols.  
Svo. *London*, 1831-37.
- Loder (Sir Edmund Giles, Bt.).** *Conifers at Leonardlee.*  
Svo. [n. d.]. **Author.**
- Long (Harold C.) and Percival (John).** *Common Weeds of the*  
*Farm and Garden.* Svo. *London*, 1910. **Harold Russell.**
- Lucas (William John).** *A Monograph of the British Orthoptera.*  
(*Ray Society*.) Svo. *London*, 1920.
- Ludwig (Robert Edouard).** *Étude de quelques levures alpines.*  
(*Univ. Genève, Thèse No. 607.*)  
Svo. *Genève*, 1918. **R. Chodat.**
- MacBride (Ernest William).** *Text-book of Embryology.* Vol. I.  
*Invertebrata.* *See Heape (Walter).*
- Marcellia:** *Rivista internazionale di Cecidologia.* Redattore  
Dr. A. TROTTER. Vol. I. 4to. (*Padova e Arellino*), 1902.
- Martyn (Thomas).** *The English Entomologist. Exhibiting all*  
*the Coleopterous Insects found in England.* 4to. *London*, 1792.  
**F. E. Robotham.**
- Maw (Percival Trentham).** *The Practice of Forestry, con-*  
*cerning also the financial aspect of afforestation.*  
Svo. *London*, 1909. **Harold Russell.**
- Menzies (Archibald).** *Hawaii Nei 128 Years Ago.*  
Svo. *Honolulu, T. H.*, 1920. **Editor.**
- Minod (Marcel).** *Contribution à l'étude du genre Stenodia et*  
*du groupe des Stenodiées en Amérique.* (*Univ. Genève, Thèse*  
*No. 606.*) Svo. *Genève*, 1918. **R. Chodat.**
- Moll (Jan Willem).** *See Oudemans (C. A. J. A.).*
- Müller (Jacques).** *Recherches sur la Lipase des Champignons.*  
(*Univ. Genève, Thèse No. 637.*) Svo. *Genève*, 1919. **R. Chodat.**
- Northrop (John I.).** *A Naturalist in the Bahamas. A Memorial*  
*Volume. Edited, with a Biographical Introduction, by HENRY*  
*FAIRFIELD OSBORN.* Svo. *New York*, 1910. **H. F. Osborn.**
- Oudemans (C. A. J. A.).** *Enumeratio Systematica Fungorum.*  
*Edited by J. W. MOLL.* Vols. i.; ii. Svo. *The Hague*, 1919-20.

- Pearl (Raymond).** The Sex Ratio in the Domestic Fowl. (Proc. Amer. Phil. Soc. lvi.) Svo. 1917. **Author.**
- Studies on Inbreeding. VII. Some further considerations regarding the measurement and numerical expression of degrees of kinship. (Amer. Nat., li.) 4to. 1917. **Author.**
- Biology and War. (Journ. Wash. Acad. Sci. viii.) 4to. 1918. **Author.**
- Pearl (Raymond) and Boring (Alice M.).** Sex Studies. X. The Corpus Luteum in the Ovary of the Domestic Fowl. (Amer. Journ. Anat. 23.) 4to. 1918. **Authors.**
- Pearson (Arthur Anselm).** The Flora of Wimbledon Common. Svo. London, 1918. **Author.**
- Phillips (Edwin Percy).** Some notes on a collecting trip to French Hoek. (S. African Journ. Sci. 1919.) Svo. [Cape Town, 1919]. **Author.**
- Porsild (Morten P.).** On "Savssats": A Crowding of Arctic Animals at Holes in the Sea Ice. (Geogr. Rev. vi.) 4to. 1918. **Author.**
- Punnett (Reginald Crundall).** Mendelism. Fifth Edition. Svo. London, 1919.
- Ray Society.** *Publications (continued).*
- GROVES (J.) and BULLOCK-WEBSTER (G. R.). The British Charophyta Vol. I. Nitelleæ.
- LUCAS (W. J.). A Monograph of the British Orthoptera. Svo. 1920.
- Rendle (Alfred Barton).** See **British Museum**: Plants. Flora of Jamaica.
- Reverdin (Louis).** Étude Phytoplantonique, expérimentale, et descriptive des eaux du Lac de Genève. (Arch. Sci. phys. nat. i.) Svo. Genève, 1919. **R. Chodat.**
- Roberts (Emmanuel).** Native remedies used in snake bites, etc. Svo. Colombo, 1919. **Author.**
- Seward (Albert Charles).** Fossil Plants. A Text-book for Students of Botany and Geology. Vol. IV. Ginkgoales, Coniferales, Gnetales. Svo. Cambridge, 1919.
- Shoobred (W. A.).** The Flora of Chepstow. Svo. London, 1920. **Author.**
- Sim (T. R.).** Flowering Trees and Shrubs for use in South Africa. Svo. Johannesburg & Cape Town, 1919. **Author.**
- Small (James).** The Application of Botany in the Utilisation of Medicinal Plants. Svo. London, 1919. **Author.**
- The Origin and Development of the Compositæ. (New Phytologist Reprint, No. 11.) Svo. London, 1919. **Author.**
- Smith (Annie Lorrain).** A Monograph of the British Lichens. A Descriptive Catalogue of the species in the Department of Botany, British Museum. Part I. (Second Edition.) Svo. London, 1918.



- Stoll (Arthur).** *See Willstätter (Richard).*
- Strobell (Ella Church).** *See Foot (Katharine).*
- Teding van Berkhout (P. I.).** Etude d'une Substance sucrée du *Polygala amara* (auct.) (*P. amarella*, Crantz). (Univ. Genève, Thèse No. 614.) Svo. Genève, 1918. **R. Chodat.**
- Thompson (Percy).** On an Annotated Copy of RICHARD WARNER'S "Plantæ Woodfordienses." (Essex Nat. xix.) Svo. 1920. **Author.**
- Tillyard (R. J.).** The Panorpid Complex. Part 3. The Wing-Venation. (Proc. Linn. Soc. N.S.W. xlv.) Svo. 1919. **Author.**
- Studies in Australian Neuroptera. No. 8. Revision of the Family Ithonidae, with Descriptions of a new Genus and two new Species. (Proc. Linn. Soc. N.S.W. xlv.) Svo. 1919. **Author.**
- Mesozoic Insects of Queensland. No. 5. Mecoptera, the new Order Paratrichoptera, and additions to Planipennia. (Proc. Linn. Soc. N.S.W. xlv.) Svo. 1919. **Author.**
- — No. 6. Blattoidea. (Proc. Linn. Soc. N.S.W. xlv.) Svo. 1919. **Author.**
- A Fossil Insect Wing belonging to the new Order Paramecoptera, ancestral to the Trichoptera and Lepidoptera, from the Upper Coal-Measures of Newcastle, N.S.W. (Proc. Linn. Soc. N.S.W. xlv.) Svo. 1919. **Author.**
- On the morphology and systematic position of the family Micropterygidae (Sensu lato). Introduction and Part I. (The Wings). (Proc. Linn. Soc. N.S.W. xlv.) Svo. 1919. **Author.**
- Trelease (William).** Winter Botany. Svo. *Urbana*, 1918.
- Watts (Rev. W. Walter).** Some Notes on *Neurosoria pteroides* (R. Br.), Mett. (Journ. Proc. Roy. Soc. N.S.W. liii.) Svo. 1919. **Author.**
- *See Dixon (H. N.).*
- Willis (J. C.).** A Dictionary of the Flowering Plants and Ferns. Fourth Edition. Svo. *Cambridge*, 1919.
- Willstätter (Richard) und Stoll (Arthur).** Untersuchungen über Chlorophyll. Methoden und Ergebnisse. Svo. *Berlin*, 1913.
- [**Wilson (W. F.).**] DAVID DOUGLAS, Botanist at Hawaii. Svo. *Honolulu*, 1919. **Compiler.**
- Woodward (B. B.).** On the *Pisidium nitidum* and *P. pusillum* of Jenyns: A Reply. (Journ. Conchol. xv.) Svo. 1918. **Author.**
- *See Kennard (A. S.).*



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- Mosses, Cardot's Herbarium of, appeal for its purchase, 7.
- Neuroterus*, nuclear phenomena in the oocytes of (Hogben), 2.
- New Caledonia, Botany of (Compton and others), 14.
- Nuclear phenomena in the oocytes of *Neuroterus* (Hogben), 2.
- Obituary Notices, 37-53.
- Omer-Cooper, J., elected, 18; proposed, 3; sec. reading, 17.
- Orchids, British Marsh, illustrations exhibited (Bedford), 18; abstract, 65.
- Orchis maculata* from Monte Gargano exhibited (Lacaita), 3.
- Organisms, types of characters in (Gates), 10-11.
- Pannikar, N. P., elected, 5; proposed, 1; sec. reading, 3.
- Parker, Dr. W. R., admitted, 13; elected, 10; proposed, 1; sec. reading, 6.
- Patton, T. K., exhibited plants from Mesopotamia and Southern India, 3.
- Paulson, R., elected Auditor, 18; lantern-slides of sporulation of gonidia in *Evernia Prunastri*, Ach., 17.
- Pearsall, W. H., elected, 56; proposed, 15; sec. reading, 54.
- Peckover, Baron, of Wisbech, deceased, 19; obituary, 46.
- Percy-Lancaster, S., elected, 18; proposed, 2; sec. reading, 17.
- Pfeffer, W., deceased, 19.
- Plant-sports produced at will (Rawson), 2; abstract, 64.
- Pocock, R. L., appointed V.-P., 55; elected Councillor, 20.
- Pranker, Miss T. L., admitted, 54.
- President (Dr. A. Smith Woodward), announcement as to 'Goodenough Fund' 7; appointed Scrutineers, 20-21; appointed Vice-Presidents, 55; elected, 21; on certain groups of fossil Fishes (Presidential Address), 25-37; on General Secretary's completion of 40 years as a Secretary, 37; on Ray Society publications, 18; on Sir J. Banks as a Trustee of the British Museum, *Suppl.*, 20-21; read proposed alterations in the Bye-Laws, 2, 3, 11, 13, 54, 56; read resolution *re* the enclosure of Wanstead Flats, &c., 17.
- Presidential Address, 25-37.
- Pugsley, H. W., elected, 18; proposed, 2; sec. reading, 16.
- Ramana-Sāstrin, Dr. V. V., proposed, 19.
- Rawson, Col. H. E., Plant-sports produced at will, 2; abstract, 64.
- Ray Society, publications referred to, 18.
- Removals from List by Council, 20.
- Rendle, Dr. A. B., elected Botanical Secretary and Councillor, 20-21; *see* Baker, E. G.
- Retzius, Prof. G. M., death announced, 9, 19; obituary, 47.
- Revision of *Baphia*, Afzel. (Lester-Garland), 2.
- Richards, R. M., proposed, 18.
- Rosenheim, Dr. O., admitted, 56; elected, 54; proposed, 15; sec. reading, 18.
- Rothschild, Lord, elected Councillor, 20.
- Rowntree, W. S., appointed Scrutineer, 20-21.
- Rubi*, British, drawings exhibited (Trower), 4.
- Saccardo, Prof. P. A., death announced, 11, 19.
- Salisbury, Dr. E. J., elected Councillor, 20.

- Salmon, C. E., elected Councillor, 20.  
 Sant, James, R.A., his painting of the first admission of women as Fellows, presented by Lady Crisp, 55.  
 Sästrin, *see* Ramana-Sästrin.  
 Schwendener, Prof. S., death announced, 9, 19; obituary, 47.  
 Scott, Dr. D. H., Councillor retired, 21.  
 Scrutineers appointed, 20-21.  
 Secretaries elected, 21.  
 Sedgwick, L. J., admitted, 9.  
 Sex and Soma (McLean), 4-5.  
 Shaw, F. J. F., admitted, 56.  
 Sheppard, A. W., admitted, 2.  
 Sibour, Louis Blaise. Vicomte de, proposed, 18.  
 Sim, Dr. T. R., elected, 10; proposed, 1; *sec. reading*, 6.  
 Skottsberg, Dr. K. J. F., Botanical features of Juan Fernandez group, 57-58.  
 Small, Prof. J., Chemical reversal of geotropic response in roots and stems, 16.  
 Smith, *see* Gardner-Smith, and Irwin-Smith.  
 Smith, Miss A. L., elected Councillor, 20; Lichens of New Caledonia, 14-15.  
 Smith, J. C., removed from List, 20.  
 Smith, Miss W., withdrawn, 20.  
 Soma, Sex and (McLean), 4-5.  
 Southee, E. A., elected, 3; *sec. reading*, 1.  
 Sowerby, G. B., withdrawn, 20.  
 Sponges, Fragrance of Calcanean; *Syncrypta spongiarum*; and notes on the physiology of sponges (Bidder), 18; volumes on, formerly the property of Prof. Minchin, presented, 6.  
 Spratt, Miss F., proposed, 57.  
 Squire, Sir Peter W., deceased, 19; obituary, 49.  
 Steindachner, F., deceased, 19.  
 Stephens, H. C., deceased, 19.  
 Sutherland, Dr. G. K., elected, 18; proposed, 5; *sec. reading*, 17.  
 Sutton, A. W., Councillor retired, 21.  
 Swanton, E. W., elected Associate, 17; proposed, 13.  
*Syncrypta spongiarum*\* (by Dr. Bidder), 18.  
 Taylor, Miss B. B., elected, 3; *sec. reading*, 1.  
 Taylor, F. H., elected, 10; proposed, 1; *sec. reading*, 6.  
 Temb , C. M., elected, 57; proposed, 18; *sec. reading*, 56.  
 Thaxter, Prof. R., elected For. Memb., 18; proposed, 13.  
 Th riot, L., Mosses of New Caledonia, 14.  
 Thompson, A. R., admitted, 5; elected, 3; *sec. reading*, 1.  
 Thomson, Miss M. R. H., elected 3; *sec. reading*, 1.  
 Tillyard, Dr. R. J., admitted, 57; The Cawthron Institute, 58.  
 Trail Award and Medal, received by Dame Helen Gwynne-Vaughan, 35.  
 Trail, Prof. J. W. H., deceased, 19; obituary, 49-51.  
 Treasurer, Annual Report, 19, 22-24; elected (H. W. Monckton), 21.  
 Tremearne, Mrs. M. N., withdrawn, 20.  
 Trower, Miss, drawings of British *Rubi* exhibited, 4.  
 Turner, J. S., deceased, 19.  
 Tutchter, W. J., deceased, 19; obituary, 51.  
 Uppsala, proposed restoration of Old Botanic Garden and Carl von Linn 's house, 57.  
 Vaughan, *see* Gwynne-Vaughan.  
 Vice-Presidents appointed, 55.  
 Vilmorin, J. de, elected, 15; proposed, 1; *sec. reading*, 13.  
 V chting, Prof. H. von, death announced, 9, 19.  
 Wager, Dr. H., Councillor retired, 21.  
 Wakefield, Miss E. M., Fungi of New Caledonia, 14-15.  
 Waldo, *see* Meade-Waldo.  
 Walsh, Col J. H. Tull, elected Councillor, 20.  
 Wanstead Flats, resolution *re* the enclosure of, &c., 17.  
 Ward, Capt. F. K., exploration of the N.E. Frontier of Burma, 17.  
 Weiss, Prof. F. E., appointed Scrutineer, 20-21; motion on alteration in Bye-Laws, 16; moved the vote of thanks for President's Address, 35.  
 West, Prof. G. S., deceased, 19; obituary, 52.  
 Whaling in the Southern Ocean, lantern-slides shown (Dakin), 55.

- White, J. W., withdrawn, 20.  
 Whitehead, A., showed lantern-slides  
 of objects obs. near Basra, 55.  
 Wilson, J. O., withdrawn, 20.  
 Wise, W., withdrawn, 20.  
 Wishart, Dr. J., admitted, 56; elected,  
 54; proposed, 13; sec. reading, 18.  
 Withdrawals, 20.  
 Wolley-Dod, Col. A. H., proposed, 19.
- Woodward, Dr. A. Smith, elected  
 President and Councillor, 20-21.
- Young, A. P., deceased, 19.
- Zoological Secretary (Prof. E. S.  
 Goodrich), elected, 21.



# PAPERS

READ AT THE

## BANKS CELEBRATION

ON

THURSDAY, 17th JUNE, 1920,

IN

COMMEMORATION OF THE CENTENARY OF THE  
DEATH OF THE RT. HON. SIR JOSEPH BANKS, Bt.,  
P.C., K.B., P.R.S.,

ON THE 19TH JUNE, 1820.

Forming a Supplement to the Proceedings of the  
Society for the 132nd Session, 1919-20.

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1920.



# SIR JOSEPH BANKS

## AS A TRAVELLER.

By B. DAYDON JACKSON, Ph.D., Gen.Sec.L.S.

I THINK that the first volume I read as a child for my own pleasure was an abridged account of Cook's Voyages, so that from a very early period of my life I have been familiar with Banks's adventures as a traveller. Since that time I have been occupied on four different occasions with the life of Banks.

(1) In 1876 the Keeper of Botany in the British Museum, Mr. W. Carruthers, suggested that I should undertake to draw up an account of Banks's life, from the material then in the Museum. The originals were only lodged with the Trustees, but it was understood that on the death of Lady Knatchbull the documents were to become the property of the Nation. Meanwhile I was given "temporary possession" of 23 folio volumes, copied from the originals just mentioned, by the daughters of Dawson Turner, whose handwriting was to be seen in places. I then had plenty of time and abundance of enthusiasm, and therefore set to work with great energy. The first two volumes contained Banks's journal of his voyage in the 'Endeavour,' 1760-71, and I made copious extracts from the narrative which so greatly interested me. For several months I continued my research, but gradually I found that the freshness and vigour of the journal had declined into the dry business statements of the official; I had lost the man, the human being, and found only the official recorder. I tried to remedy this by hunting for personal and private letters, but at that time the letters, which afterwards became available, were not to be found, and consequently my notes were laid aside, and not cast into a 'Life' which I felt would be destitute of human interest.

(2) These notes, however, were of great use afterwards, when I wrote the life of Banks for Leslie Stephens's 'Dictionary of National Biography.'

(3) Early in 1893 Sir Joseph Hooker spoke to me of his fruitless search after Banks's Journal, which he remembered his aunts copied for their father, Dawson Turner. I was able to assure him that this transcript was still in the Department of Botany, British Museum, and ultimately had the two volumes copied, which, after being edited by Sir Joseph, were published by Macmillan and Co. in 1896.

(4) Once more my notes were used for a life of Banks, this time by Mr. Edward Smith, which came out in 1911; by this time several volumes of letters written by Banks were available, and Mr. Smith made good use of this advantage.

Thus from infancy to age I have had before me the inspiring personality of Sir Joseph Banks, and am glad to take part in the present celebration of a remarkable man.

As I have to deal with the earlier life of Banks, I venture to prefix a few remarks on his birth and upbringing.

He was born in Argyle Street, a short distance from the room in which we are assembled, in February 1743, his ancestors being Lincolnshire people: his father, William Banks, who succeeded to the family estates in 1736; his mother, Marianne, daughter of William Bate. His school-days were passed at Harrow, whence after four years he was sent to Eton, where he earned the reputation of being devoted to play, but not addicted to books. From Eton he went up to Christ Church, Oxford. In 1761 his father died, leaving Joseph, still a minor, and a sister to the care of their mother.

At the time when Banks went up, the Professor of Botany was Humphrey Sibthorp, and as no lectures were delivered at Oxford, he arranged with Sibthorp to get a lecturer, which he accomplished by going to Cambridge, and bringing back with him Israel Lyons. Banks went down in December 1763, and in the following February he came of age, and established himself at Revesby.

In 1766 he engaged on his first voyage. An Oxford friend, Lieut. Constantine Phipps, afterwards second Baron Mulgrave, was on the 'Niger.' Capt. T. Adams, which was ordered to Labrador and Newfoundland on business concerning the fisheries. He suggested that Banks should accompany him, which idea was warmly entertained; the 'Niger' sailed on 22nd April, 1766, and reached Newfoundland 11th May; thenceforward Banks was busy on plants, birds, and fishes. The vessel made for Lisbon on her return, and reached that port on 2nd November, remaining there some weeks, enabling Banks to familiarize himself with Portuguese productions. In 1767 he made two trips inland, westwards, and to Wales.

The next year brought the great opportunity, which Banks seized. The Royal Society wanted accurate observation of the Transit of Venus, due in 1769, and arrangements were made for parties to proceed to Madras, Hudson Bay, and an island in the Pacific Ocean. James Cook, then a lieutenant in the Royal Navy, was chosen commander of the 'Endeavour,' a Whitby-built collier, and Banks, with Daniel Solander, and a staff of draughtsmen and servants, nine in all, were assigned quarters on board.

The 'Endeavour' left Plymouth on 25th August, 1768, and sailed to Madeira, where five days were spent; then it set its course to Rio de Janeiro, which was gained on the 13th November. On the way Banks and his company were constantly netting fish and marine animals and shooting sea-birds, describing and figuring those which were new to science.

The expedition was very badly treated by the Portuguese

colonial officers at Rio; the explorers were not allowed to land, but Banks went ashore one day before daybreak, and stayed till it was dark. After a fortnight's stay, the 'Endeavour' was fired upon for attempting to leave without permission; it turned out that the responsible brigadier had forgotten to send the permission, which had been written out some days before.

From Rio the voyage was continued to Tierra del Fuego. Banks and Solander landing on Staten Island. Two days later they ran the risk of perishing in the snow, a tale well known but worthy of being mentioned in its proper place. Solander, Banks, Monkhouse (midshipman), and Green (astronomer) set out to get well into the country and ascend the hills, which were bare of trees. On starting, the weather was much like a sunshiny day in May; on reaching the plains, they found the level surface consisted of low birch-bushes reaching waist-high, which formed the most tedious travelling. In the midst of this, Mr. Buchan, an artist, fell into a fit. A fire was lit for him, and the more active pushed on for the next hill. It was now very cold, with frequent snow-blasts, so all hope of getting back to the ship that day was given up, and they tried to get into the middle of a wood and to make a fire, Banks bringing up the rear. The cold increased, and Solander said he could go no further, but must lie down, which he did, in spite of all Banks could say. A black servant did the same. Banks now despatched five of the party to make a fire at the first convenient spot, whilst he and four remained to get Solander and the negro along. Both again laid themselves down to sleep, when the welcome news came of the fire lit a short distance ahead. Banks took charge of Solander, and left two hands to remain with the negro; after getting warmed, a party was sent back, but it was found impossible to get the sleepers forward; they were therefore covered with boughs of trees. One culture formed the whole provision for the party.

The next morning the weather improved, and the party reached the shore in three hours, having made a half-circle. On getting on board, they numbered two invalids, and two had been lost.

The 'Endeavour' sailed hence towards Tahiti, and arrived there after three months' passage. The voyagers quickly found the natives adepts in theft, and during the whole time of the ship's stay this malpractice had to be guarded against. The climax was the theft of the astronomical quadrant, and Banks, as usual, had to be the thief-catcher: the temperature was  $91^{\circ}$  Fahr., but the activity of Banks resulted in all the parts being restored. It seems extraordinary that only one quadrant should have formed part of the equipment, as the whole object of the expedition depended upon that single instrument, which might well have remained undiscovered among the many natives who had taken parts of it.

The transit having been duly observed, the expedition left Tahiti after a stay of three months, and four months later made

New Zealand, which was sailed round, and finally left on 31st March, 1770, the ship heading towards Australia; Botany Bay was sighted, and soon after the first kangaroo was seen. Not long after this the ship struck upon a coral-rock, and by the moonlight her sheathing-boards and false-keel were seen to come away. Day brought calm weather, and the crew began to lighten the ship. By night the ship was almost afloat, but the leak was only kept under by all the pumps working. At last she was hauled off, and seemed to make no more water than when fast on the rock. After his hard work Banks threw himself down for a rest, when the alarming news was reported that the water had gained four feet in the hold. All hands started again to work, and then it was found that the carpenter had made a mistake in sounding. At this juncture one of the midshipmen proposed the expedient of "fothering," by taking a sail and stitching handfuls of oakum and wool in rows; this sail was drawn under the ship, and the suction of the leak drew the loose materials into the gap, and stopped the flow of water.

The ship was next worked into a harbour, the mouth of the Endeavour River, where she was run ashore and her bottom repaired; the leak was found to be partly stopped by a piece of rock as large as a fist being stuck in it and broken off short. Finally, the ship was worked out through the barrier-reef by Cook's Passage. Java and Timor were passed, till Batavia was reached in October 1770. Sickness then broke out, and Banks, Solander, and Cook were prostrated by fever, the first victim to the climate being Monkhouse, the ship's surgeon. The requisite repairs to the ship being finished, they set sail on Christmas Day. Several of the crew died at Batavia, and many more before the Cape was reached; in turn St. Helena was visited, and on the 12th July, Banks landed at Deal.

It may be mentioned that not only Dr. Hawkesworth, but Lieut. Cook adorned their somewhat prosaic narratives with purple patches from Banks's more vivid accounts.

Sir Joseph Hooker's estimate of Banks's services on the Expedition are as follows:—"It needs no reading between the lines of the great navigator's [*i. e.* Cook's] Journal to discover his estimation of the ability of his companion, of the value of his researches, and of the importance of his active co-operation on many occasions. It was Banks who rapidly mastered the language of the Otahitans and became the interpreter of the party, and who was the investigator of the customs, habits, etc., of these and of the natives of New Zealand. It was often through his activity that the commissariat was supplied with food. He was on various occasions the thief-taker, especially in the case of his hazardous expedition for the recovery of the stolen quadrant, upon the use of which, in observing the transit of Venus across the sun's disc, the success of the expedition so greatly depended. And, above all, it is to Banks's forethought and at his own risk that an Otahitan man

and boy were taken on board, through whom Banks directed, when in New Zealand, those inquiries into the customs of its inhabitants, which are the foundation of our knowledge of that interesting people. And when it is considered that the information obtained . . . the fulness and accuracy of the description of the New Zealanders, even as viewed in the light of modern knowledge, are very remarkable. Nor should it be forgotten that it was to the drawings made by the artists whom Banks took in his suite that the public is indebted for the magnificent series of plates that adorn Hawkesworth's account of the voyage. Still another motive is that Banks's Journal gives a life-like portrait of a naturalist's daily occupation at sea and ashore nearly one hundred and thirty years ago; and thus supplements the history of a voyage which, for extent and importance of geographic and hydrographic results, was unique and 'to the English nation the most momentous voyage of discovery that has ever taken place,' and has, moreover, directly led to the prosperity of the Empire; for it was owing to the reports of Cook and Banks, and it is believed, to the representations of the latter on the advantages of Botany Bay as a site for a settlement, that Australia was first colonised." (Journal, pp. viii, ix.)

Sir John Pringle, President of the Royal Society, took Banks to Kew, and introduced him to the King; an audience was granted on the 10th August, when Banks and Solander had a long conference on their discoveries and marvellous adventures. A cordial friendship thus arose between George III. and Banks, which resulted in great benefits to Science, as you will be reminded almost immediately.

The friendship between Banks and Lord Sandwich, the Chief of the Admiralty, was increased by the success of this voyage, and so soon as the month of September in the same year another expedition was being planned, with two vessels under Cook. Banks readily consented to share in the expedition, and his preparations were on a still more costly scale than on the former voyage. But difficulties arose from the additions which had been made in the 'Resolution' to accommodate the naturalists, and ultimately all Banks's stores were removed from the ship, and he withdrew from the expedition. The Forsters, father and son, took his place.

The extensive preparations made by Banks were not, however, fruitless, for they were used for an expedition to Iceland on a ship specially chartered by Banks; it sailed on 12th July, 1772, with a party of forty persons. Passing down the Channel, they landed for two days in the Isle of Wight, touched at Plymouth, and then shaped a course for the Western Islands of Scotland. Whilst lying in the Sound of Mull, a chance meeting of friends revealed the fact of an island which had hardly ever been visited. A boat was equipped with two days' provisions, and Banks and his party made their way to Staffa, which was discovered in this

manner. Banks wrote a full account in his Journal, which was copied into several publications, thus bringing the island into notice.

On 28th August the vessel reached Iceland, and they remained a month on shore. Their tour took in many of the most remarkable features, as Thingvalla, the Geysers, Hekla, the Hvitae, etc. Banks was one of the first, perhaps the first, to ascend Hekla, which he did in a storm of wind, with frost on the ground, and cold enough to freeze the moisture in the air on their clothes. The return from Iceland was leisurely, and it was not till 19th November that Banks, Solander, and Dr. Lind left Edinburgh for London.

Once more Banks travelled abroad; in March 1773 he went to Rotterdam, and attended a meeting of the Batavian Society, where he spoke of his wish to undertake a voyage towards the North Pole.

This closed the career of Banks as a traveller, for his journeys through England, as to and from Revesby to London, are not adventurous enough to be ranked with his oversea experiences. At the age of 30 this chapter of his life closed, and the remaining forty-seven years fall within the province of my colleagues to narrate.

*Select Bibliography.*

- HAWKESWORTH, JOHN (1715?-73). An account of the voyages . . . by Captain Cook . . . from the papers of J. Banks, Esq. London, 1773, 3 vols. 4to.
- COOK, JAMES (1728-79). Captain Cook's Journal during his first voyage round the world made in H.M. Bark 'Endeavour,' 1768-71 . . . with notes by W. J. L. Wharton. London, 1873. 8vo.
- BANKS, *Rt. Hon. Sir* JOSEPH, *Bt.* (1743-1820). Journal . . . during Captain Cook's first voyage in H.M.S. 'Endeavour' in 1768-71, etc., edited by Sir Joseph Hooker. London, 1896. 8vo.
- [Life in] Dictionary of National Biography, vol. iii. 129-133 (1885), by B. D. J.
- SMITH, EDWARD (?). The life of Sir Joseph Banks, President of the Royal Society, etc. London, 1911. 8vo.
- MAIDEN, JOSEPH HENRY (1859- ) Sir Joseph Banks: the 'Father of Australia.' Sydney, 1909. 8vo.
- FROEL, UNO VON (1746-1803). Bref rörande en resa til Island, 1772 . . . 1777. Tr. by J. R. Förster from the German version, as 'Letters on Iceland . . . [with] an account of the Island of Staffa, communicated by J. Banks, etc.' London, 1780. 8vo.  
Republished in Pinkerton, Voyages, vol. i. 1808. 4to.



## BANKS AS PATRON OF SCIENCE.

By A. B. RENDLE, M.A., D.Sc., F.R.S., Sec.L.S.

A VERY early instance of Banks's interest in the promotion of Science is found in his time at Oxford. Banks wished to learn something of Botany, but the teaching of Botany was apparently not one of the functions of the then Professor, Humphrey Sibthorp; however, he was pleased to approve a suggestion by young Banks that a lecturer or reader might be provided who should be remunerated by contributions from his students. No such person being available at Oxford, Banks rode to Cambridge to consult John Martyn, who was able to supply the want in the person of Israel Lyons, a mathematician and botanist of Trinity, from whose teaching Banks and his fellow-students at Oxford profited.

The long three-year voyage with Capt. Cook, suggesting to a mind keen on the pursuit of Natural History and quick to appreciate its application in the interest and for the delight of his fellow-men, the wonderful possibilities of botanical exploration in little-known parts of the world, supplied the stimulus for the numerous remarkably varied schemes and pursuits which lead us to regard Banks as a great patron of Science. On his return to England in 1771 Banks found himself already famous. He was introduced to the King, and a friendship began which was fraught with great benefit to Science and to humanity. The King habitually consulted Banks on matters bearing on the welfare of his people, and Banks was able to suggest or help forward useful schemes.

In the autumn of 1777 Banks took the large house in Soho Square (No. 32), which was his principal residence for the rest of his life, and which became the resort of students, who were free to consult the fine library, museum, and herbarium, and of all classes of persons interested in schemes of philanthropy or for the advancement of Science.

The French traveler and scientist, Barthélemy Faujas de Saint-Fond, writes ('Travels in England and Scotland and the Western Islands in 1784'):—

Banks's house was the "rendezvous of those who cultivate the sciences. They assemble every morning in one of the apartments of a numerous library, which consists entirely of books on Natural History, and is the completest of its kind in existence. There all the journals and public papers, relative to the sciences, are to be found; and there they communicate to each other such new discoveries, as they are informed of by their respective correspondents, or which are transmitted by the learned foreigners who visit London, and who are all admitted into this society. A friendly breakfast of tea or coffee supports that tone of ease and fraternity which ought universally to prevail among men of Science and letters."

Banks had been elected F.R.S. in 1766 at the age of 23. His election as President twelve years later indicates the position he had already attained in the scientific world. Though other names were suggested, there was a general opinion that no one was so well qualified to occupy the vacant chair, and Banks was elected practically unanimously.

Thus at the age of 35 Banks occupied the premier position in the scientific world, was *persona grata* at Court, possessed ample means, and a knowledge gained by actual experience of the resources, as yet largely untapped, of the globe. To these were added an attractive and powerful personality, good health, and an intense enthusiasm for doing things and getting things done.

It is to be regretted that there is no record of a long life of unremitting work and remarkably varied usefulness beyond what can be pieced together from the correspondence extending over more than 50 years, a copy of which is in the Department of Botany of the British Museum.

For 42 years Banks was President of the Royal Society; it has been said—he was the Royal Society. He ruled as an autocrat; but it would seem that on the whole he ruled wisely and acted in what he regarded as the best interests of the Society. During the early years of his occupancy of the Chair some friction arose between President and Secretaries. Banks was anxious to raise the standard of the Fellowship, and announced that he meant to watch over applications for admission. He freely expressed his opinion on the merits of candidates, and advised for or against their election at the time of ballot. The rejection of a number of candidates gave offence to some of the Fellows, and in 1783 the discontent came to a head in an effort by a strong party to supplant Banks, who was also accused of a lack of sympathy with the mathematical side of the Society's work. However, a motion, which was seconded by the Hon. Hy. Cavendish, "that this Society do approve of Sir Joseph Banks as their President, and mean to support him in that office," was carried by 119 against 42. After the election of a new Secretary a few months later, in which Dr. Blagden, who was supported by Banks, secured a majority of 100 (139 to 39) over the candidate put forward by the opposition, the meetings resumed their former peaceful character.

As regards our own Society—I was asked a few days ago, *à propos* of our present commemoration, what special connection Sir Joseph Banks had with the Linnean Society. The Royal Society, the British Museum, the Royal Gardens, Kew,—the association of Sir Joseph Banks with these is, or should be, generally known; but what special interest had he in the Linnean Society? Though Banks played an important part in the development of the three institutions above-named, with which his name has been associated, he found them all in existence. It is probable that had it not been for Banks the Linnean Society of London would not have come into being when and how it did.

After the death of Linnæus in 1778, his herbarium, other collections, and library passed to his son, who died five years later. Linnæus's widow, doubtless in the hope of securing a higher price than would have been given in Sweden, offered the collections and library to Sir Joseph Banks for the sum of 1000 gs. Banks, who had already a large herbarium, was not inclined to acquire them, but urged his friend Dr. James Edward Smith, a young man who was much interested in Botany, to purchase them, and Smith became, in 1784, the possessor of the whole of Linnæus's library, museum, and MSS. for the sum of 900 gs. In 1788 Dr. James Edward Smith founded the Linnean Society, and at the first meeting for the election of Fellows Banks was appointed one of three Vice-Presidents. Thus had it not been for the European fame which Banks had acquired as a liberal patron of Science, the original offer would not have been made, and had it not been for Banks's kindly interest in the scientific pursuits of a younger man the offer might merely have been declined. In either case the story of our Society would have been different, and its reputation as the home of the collections of the founder of systematic natural history might have been wanting. Thus the connection of Banks with our Society, though indirect, was of some importance.

Again, the Linnean Society is the principal medium in this country for the publication of work dealing with taxonomic botany, and Sir Joseph Banks, by his own travels and by initiating and encouraging work of botanical exploration in all parts of the world, did magnificent service towards advancing the study of systematic botany. At any rate, Banks was a liberal supporter of this Society; for instance, he bore the cost of the copper and engraving of the 20 plates in the first volume of the 'Transactions.'

In 1800 the Royal Institution was founded, the outcome of a suggestion by Count Rumford for popularizing Science by lectures and laboratory work. It was at Banks's house in Soho Square that the meeting was held at which the proposition was adopted.

Sir Joseph was also one of the seven gentlemen who met at Mr. Hatchard's shop in Piccadilly on 7th March, 1804, and founded a Society for the study of Horticulture, which subsequently became the Royal Horticultural Society. The Earl of Dartmouth was the first President, and Sir J. Banks one of the Vice-Presidents.

The Royal Gardens, Kew, had attained considerable importance under the Princess Augusta with the assistance of the Earl of Bute, a keen botanist who took an active part in developing the botanical side of the Gardens. On the death of the Princess in 1772, George III. maintained the botanical character of the establishment with even greater energy than his mother, the place of botanical adviser being now taken by Sir Joseph Banks, who was virtually through the greater part of his life Director of the Gardens. Banks conceived the notion of making Kew the depository of every known plant that could be useful or ornamental in a climate like our own, and collectors were despatched on numerous

expeditions to different parts of the world for plants and seeds. The names of some of these collectors will be familiar to us:—Francis Masson, who visited the Cape of Good Hope twice, Madeira, the Canaries, Azores, Spain, Tangier, and the Balearic Islands, and finally succumbed to the cold of a Canadian winter; Archibald Menzies, a young Scotch surgeon who came with an introduction to Banks from Dr. Hope, the Edinburgh Professor of Botany, and was appointed under Banks's directions naturalist to the expedition to the Pacific under Capt. Vancouver on the 'Discovery'—among his discoveries are the Californian Redwood (*Sequoia sempervirens*), and the Chili Pine (*Arucaria imbricata*); and George Caley, whom Banks appointed in 1801 to collect in New South Wales. Medical men and others residing oversea were also brought into correspondence and encouraged to send plants home. Among correspondents in the East were the brothers Russell at Aleppo, the authors of a History of Aleppo, König, Naturalist in the Carnatic to the East India Company, Dr. Roxburgh, the pioneer exponent of the Indian Flora, the Moravian Brothers Mission, and others.

Banks was the moving spirit in arranging and fitting out the expedition of the 'Bounty' in 1787, under Captain Bligh (a friend of Banks who had served under Capt. Cook), for transporting Breadfruit trees from Otaheite to the West Indies; and most explicit instructions were drawn up by Banks for David Nelson, the gardener, as well as for the general conduct of the expedition. The mutiny on the 'Bounty' after leaving Otaheite with the supply of Breadfruit is matter of history. Banks must have been bitterly disappointed at the tragic failure of the attempt, but he took the matter up again without delay, and in less than two years a second expedition was fitted out and 300 trees were safely landed both at Jamaica and St. Vincent.

Banks's ample means were an important factor in his success as a patron of Science. But though he used his means with discretion he was generous in helping others. For instance, Banks himself had been at considerable expense in preparing for Capt. Cook's second expedition of 1772, which he was to join on similar conditions to those in which he had previously accompanied Cook; but the arrangements fell through at the last moment. Dr. Lind, physician, traveller, and astronomer, who was to have formed one of the party, had also been at some expense which Banks offered to reimburse. "He told me," writes Lind to a friend, "that he looked on his estate as belonging to his friends as well as himself; that he held me as one of them, and begged me to command my share of it whenever I wanted it."

Through Banks's liberality Francis Bauer, the eminent Austrian floral painter who accompanied Baron Joseph Jacquin to England in 1788, was attached as draughtsman to the Botanic Garden at Kew, a post which he occupied for 50 years. Banks not only paid his salary during his own life but provided for its continuance after his death (see 'Delineations of Exotic plants cultivated in the Royal Gardens at Kew,' 1796.)

The name of William Herschel, the great astronomer, recalls another instance of Banks's power and willingness to help. Herschel was a singularly modest man whose work was in danger of being hampered through pecuniary difficulty. Banks prompted by Dr. Wm. Watson, a mutual friend, used his personal influence with the King, the result being that an appointment worth £200 a year was found for Herschel, who was also presently received at Court, provided with quarters at Windsor, and thus enabled to devote his whole time to his astronomical work. The correspondence contains a number of letters from Watson and Herschel to Banks, in some of which detailed accounts of Herschel's work are given, indicating that Banks's interest in his discoveries was by no means superficial but at times even critical. The following extracts from the correspondence bear on Herschel's appointment.

Wm. Watson to Sir Joseph Banks.

"Among the motives which have induced me to write to you, I will not conceal my wish that *you* may be the person to whom my Friend may be chiefly indebted for his success. It was you, who first mentioned him to the King, and occasioned the honourable invitation he received from him. Finish therefore, Dear Sir, the noble work you have begun, by an application to the King, the success of which I cannot doubt, and remember that you may feel hereafter the great satisfaction in having been the chief instrument in the honourable establishment of so ingenious and excellent a person, who has already done so much tho' fettered by his present profession, & from whom so much more may be reasonably expected, whenever his situation shall permit him the undisturbed exertions of his great abilities."

Bath, June 29, 1782.

Wm. Herschel to Sir Joseph Banks.

"Sir,

I have been in hopes of soon having the Honour personally to make my acknowledgments to you for the favour of your mentioning me to his Majesty in so advantageous a light, but till I have that opportunity will not defer by a few lines to return the sincerest thanks for your kindness. To it, is owing the gracious reception I have met with from his Majesty, who has provided for me so as to put it now in my power to devote all my attention to Astronomy and Optics. It will at all times be my greatest ambition to endeavour to render myself worthy of the patronage of Sr. J. Banks, and to prove with how much sincerity and respect I am

Sir,

Your most oblig'd and  
most obédt. humble Servt.

WM. HERSCHEL."

Queen's Lodge.

Windsor, Aug. 26, 1782.

Among the many schemes with which Banks was connected was the Association for Promoting the Discovery of the Inland Districts of Africa. Useful pioneer work was done by this Society though at the cost of life and treasure. The most successful expedition was that to the Gambia under Mungo Park, a young medical man and protégé of Sir Joseph's, 1794-97; a second expedition under Park in 1805 to the Niger met with disaster.

Banks also secured the appointment of his friend Afzelius, a young Swede, as botanist to the Sierra Leone Company; and large collections were made during the four years of his stay, 1792-96.

In 1798 Mungo Park had been asked by the Government to join a surveying expedition to New Holland, but the matter fell through. The event was however the occasion of the introduction to Banks of Robert Brown in the following letter from Josef Correa de Serra, a Portuguese exile resident in London and an intimate friend of Banks.

“Soho Square, 17th October, 1798.

“Right Honble Sir.

I hope you will not take amiss, my interference in the subject of this note. Mr. Brown, a very good naturalist, who frequents your Library, where I have made acquaintance with him, hearing that Mungo Park does not intend to go any more to New Holland, offers to go in his place. Science is a gainer in this change of man; Mr. Brown being a professed naturalist. He is a Scotchman fit to pursue an object with constance and cold mind. His present situation is of Ensign and Assistant Surgeon in the Fife-shire Fencibles, previous to which employment he received a regular Litterary education at Edinburg. It is by his own desire that I take the Liberty of making you acquainted with his wishes; his modesty deterring him from writing to you himself.

I am sir most respectfully yours

J. CORRÊA DE SERRA.”

Two years later Brown was offered and accepted the post of Naturalist on board the ‘Investigator,’ which was being fitted out for a voyage of scientific exploration to New Holland under Capt. Flinders.

Ferdinand Bauer went as the botanic draughtsman. Brown returned in October 1805, and in January 1806 Sir J. Banks reports to the Board of Admiralty the extent of the collections, which were estimated as representing 3600 species of plants, besides other natural history collections, and 2064 sketches by Bauer. Banks also arranged that the salaries of Brown and Bauer should be continued in order to enable them to complete their work. “I will undertake,” he writes, “to direct the progress of these gentlemen, to quicken them if they are dilatory, to assist

them when it is in my power and to report to their Lordships the progress made by each in his respective department once a year at least."

On the death of Dryander in 1810 Brown succeeded him as librarian to Sir J. Banks, and remained in charge of the library and herbarium until the death of his patron in 1820. At Banks's death it was found that his magnificent library of Natural History, his Herbarium, manuscripts, drawings, engravings and other collections had been bequeathed to the British Museum subject to a life-interest in them by Robert Brown, who however was empowered to cause the collections to be transferred to the Museum during his life-time. This transfer was effected in 1827, and the Botanical, or, as it was for many years known, the Banksian Department of the British Museum was established, under the keepership of Robert Brown, a lasting monument of the devotion of Banks to the Science of Botany in the pursuit of which he had travelled far, spent much and worked unremittingly.

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## BANKS AS BOTANIST.

By JAMES BRITLEN, F.L.S.

THE position of Banks as a pioneer of scientific travel and as a patron of science generally has been so universally recognized and has been so summarized by the two previous speakers, that it might seem that there was little left to say about him. But there remains an aspect of his work which has only in comparatively recent times received the attention which it deserves, and which it has been thought might adequately form the subject of a few remarks on this occasion. That I should have been honoured with a request to say something about Banks as a botanist is due to the fact that I have for nearly half a century been intimately acquainted with the material supplied by the Herbarium of which his collections were the foundation.

It is by such intimate acquaintance, not only with the collections but with the other material contained in the Department of the British Museum which was at one time known as "the Banksian," that an adequate estimate of Banks's knowledge can be formed. Of that material an important item is the transcript of his Correspondence, in twenty-one volumes, by the daughters of Dawson Turner; the distressing history of the originals of this is set forth by Mr. Carruthers in a letter to Sir Joseph Hooker prefixed to his publication of Banks's Journal—itself printed from a similar transcript in the same Department.

To enter upon a description of the contents of these volumes would be beyond my present province: it must suffice to say that they include letters from leaders of science and art and from others whose names are prominent in the history of the period—1766–1819—which they cover. Botany of course holds its place among the subjects discussed in the letters; but the evidence scattered through his Herbarium and still more the MSS. in his hand relating to his travels and the plants then collected afford abundant testimony to the prominent position which that science—the first which attracted him—held in Banks's esteem and to the knowledge which he possessed, and it is especially to the MSS. that I propose to call attention.

Perhaps the most interesting are those connected with his voyage to Newfoundland in 1766. Of this voyage Banks kept a Journal, which, after the dispersal of his MSS. in 1886, came into the possession of the late S. W. Silver, a Fellow of this Society, at whose death it was purchased, with the rest of his library, by the South Australian Branch of the Royal Geographical Society of Adelaide. It was in two volumes; of the first of these, from April 7 to Nov. 17, we have in the Department of Botany a transcript by Banks's sister Sarah Sophia, made in 1772; the second of only nineteen pages, from his arrival in the *Tagus* at the latter date, contains nothing of interest. In the 'Journal of Botany' for 1904 I gave some account of the Newfoundland Journal, which is of considerable topographical and scientific interest and abounds in notes on the natural history of the island, and expressed a hope that it might be published; it would be a graceful commemoration of this centenary if the Linnean Society could see its way to such an undertaking, but this would probably be impracticable under present conditions. A MS. note in the Correspondence states that this is the earliest Banksian journal in existence.

Another MS. volume contains Banks's MS. list of the 220 plants collected—this is the earliest catalogue of Newfoundland plants, and as such is well worthy of publication. It is arranged in accordance with the Linnean system, and the habitat and locality of each species is noted; specimens of each are in the Herbarium, the sheets being endorsed by Banks with the locality in accordance with Linnæus's direction (*Phil. Bot.* p. 7). It appears from a note in his Journal that Banks also collected "a box of seeds" and a "box of earth with plants in it"; but these were destroyed in a severe storm encountered on the fifth of November "off the Western Islands" on the homeward voyage.

On his return Banks employed Elret to make drawings of twenty-two of the more interesting of his plants; these, beautifully executed on vellum, are also in the Department of Botany. Five of them are reproduced in Aiton's '*Hortus Kewensis*,' and on the original drawings of three is a note by Banks stating that they were taken from "dry specimens brought from Newfoundland."



I have dwelt on the Newfoundland collection at length because it gives more definite evidence of Banks's individual botanical attainments than is afforded by any of the later work in which he was associated with Solander, whose greater fame as a botanist has naturally overshadowed that of his patron, and to whom exclusively is sometimes attributed work for which the two men were jointly responsible. Thus the new species described in the second edition of Alexander Russell's 'Natural History of Aleppo' (1789) are generally quoted as of Solander, although Patrick Russell in his preface expressly states that the catalogue of plants was drawn up by both botanists. But the records of the Newfoundland expedition contain no indication of any co-operation on Solander's part, and show that Banks, at the age of 24, had already obtained considerable botanical proficiency.

In the year between the Newfoundland voyage and the departure of the voyage to the South Seas, Banks visited the west of England: the Journal which he kept during his excursion was acquired by Mr. Spencer George Percival, who published it in the 'Proceedings of the Bristol Naturalists' Society' for 1898 (ix. 6-37).

From his school days at Eton, Banks had been interested in British plants; we are told that while at school he paid some women, "cullers of simples," to bring him specimens of each plant they collected, for which he paid them sixpence; that, finding at home an old torn copy of Gerard's Herbal, he took it back to Eton with him, and that while there he made considerable collections of plants and insects; his botanical studies were continued during his university career at Oxford. A letter from Lightfoot dated Feb. 27, 1766—the first of the transcribed Correspondence—shows that Banks was at that time in active correspondence with the writer and with other botanists; and Lightfoot's account of his own earlier visit to St. Vincent's Rocks may have prompted Banks to the investigation of the plants of that locality recorded in the Journal of the West of England excursion. Banks again visited the West in 1773—this time in company with Lightfoot on the way to and from their joint expedition to Wales. Of this journey Lightfoot kept a diary, which is printed in the 'Journal of Botany' for 1905, with four letters written later to Banks relating to plants collected on the occasion. The Herbarium contains specimens of the plants collected—among them some not mentioned by Lightfoot; the sheets bearing the names in Banks's hand and are endorsed by him with notes giving locality and date: thus of *Euphorbia Lathyris*, then first noted as a British plant, he writes: "I found this one plant among the Ligustrum on the south side of the Steep Holmes Island, but being hurried by the tide had not time to search for more." Writing of this expedition Lightfoot says: "I believe it may without vanity be said that few, if any, Botanical Excursions in Great Britain have exceeded our collection either in Number or Rarity of Plants."

It is generally stated that Banks made the acquaintance of Solander (who came to London in 1760) in 1767; but in the first letter of Lightfoot reference is made to the latter in a way which indicates that at that period at latest—the beginning of 1766—Banks had knowledge of him as a botanist. Solander became a Fellow of the Royal Society in 1764 and Assistant-Librarian in the British Museum in the following year, and it seems reasonable to suppose that Banks had met with him in one of these positions.

That Banks was thoroughly acquainted with Solander's botanical qualifications is evident from the fact that when, in 1768, he proposed to join the voyage to the South Seas in order to observe the transit of Venus, Solander was invited to accompany him as naturalist—it may be noted that the arrangements for collectors and collections were carried out entirely at Banks's expense, at an estimated cost of £10,000. He engaged as one of the artists Sydney Parkinson, a young Scotchman who had been commended to his notice by John Lee, the well-known nurseryman of Hammersmith. In 1767 Banks sent Parkinson to draw at Kew, and the drawings then made (on vellum) are in the Department of Botany. Banks expressed the greatest satisfaction with Parkinson's work during the voyage—"he behaved to me uncommonly well, and with unbounded industry made for me a much larger number of drawings than I ever expected." The total number made during the voyage was 955, of which 675 were sketches and 280 finished drawings. All the Australian and most of the New Zealand ones are sketches; those from Brazil, Madeira, Tierra del Fuego and the Friendly Islands are nearly all finished drawings; of the Java plants there are 44 finished drawings and 72 sketches; in a few cases Parkinson made both sketches and finished drawings of the same plant. On the back of the sketches are notes by Parkinson of the colour of the leaves, flowers, etc., and the locality is added by Banks.

As is well known, finished drawings from the sketches were made for Banks by various artists on the return of the voyage, during which Parkinson had died, and copper-plates were prepared for publication: from these a certain number of the Australian plants were reproduced in a volume published by the Trustees of the British Museum in 1900-1905; in the introduction to this I have given a detailed account of the history of the collections. Parkinson's drawings and sketches, with the finished drawings of other artists and impressions of the copper-plates, form a series of volumes in the Department of Botany.

The description of the plants collected during the voyage was of course the work of Solander, whose manuscripts—both the original draft and a fair copy prepared for publication—are in the Department: but we have also a list of the collections in Banks's hand, geographically arranged, in the order in which they were loosely placed in the drying books in which they were brought home: in this the species supposed to be new are indicated by

“mscr.” appended to the name, and the number of specimens collected of each plant is indicated.

In the volume published by the British Museum I have attributed the names of species which have been adopted by various authors from the Solander MSS. to Banks and Solander jointly, although in many instances Solander alone was originally cited for them. The joint responsibility seems to have been recognized by their contemporaries: thus Smith, writing in Rees's *Cyclopaedia* (under *Jasminum*), referring to what are usually known as the Solander manuscripts, speaks of them as the work of both; a similar indication by Patrick Russell has already been mentioned.

In 1772 Banks went to Iceland, accompanied by Solander and by J. E. Miller as artist; it would seem that he kept a journal of the voyage, but this cannot be traced. The specimens collected by him are, however, in the Herbarium, and there is a volume of memoranda in MS. connected with the visit, which includes a rough list in Solander's hand, wherein the principal plants obtained are described. Most of the sketches—11 in number—are endorsed by Banks with the name and locality.

After 1773, as the Correspondence more than once referred to shows, Banks was occupied by the consideration of a number of subjects, of which botany was only one. In 1766 he had become a Fellow of the Royal Society, in which he soon occupied a prominent position, and in 1778 was elected President. From this time his practical interest in Botany was mainly confined to his Herbarium, for the curatorship of which he secured in succession Solander and Dryander, to whose industry and knowledge its value is mainly due.

The Herbarium is indeed in some respects the greatest evidence of Banks's position as a botanist; it was not the formation of a man whose primary instincts were those of a collector but of one who knew the value and interest of what he acquired, and who was willing to allow others to share the treasures which he had secured. These included the large collection of drawings and MSS., of which a list is given in the official ‘History’ of the Museum Collections; among the latter are the series of volumes known as the Solander manuscripts—the work mainly of Solander and Dryander—which may be regarded as a key not only to the Banksian but to the Sloane collections, and form the basis of Aiton's ‘*Hortus Kewensis*.’ Among the herbaria secured by Banks are those of Herman, Clifford (on which the ‘*Hortus Cliffortianus*’ was based), Gronovius, William Houston, John Reinhold Forster and George Forster, Jacquin, Phillip Miller, and Loureiro. Among those who have testified to the value of the collections and to the readiness with which they were placed at their disposal may be mentioned Swartz, Thunberg, the elder DeCandolle, and Gaertner, who in his ‘*De Fructibus*’ (1788–1805) continually acknowledges his indebtedness to the Herbarium, from which he describes many novelties. The importance of the Herbarium is thus summarized

in a note by Gawler (afterwards Ker) in the 'Botanical Register' for 1817, with which this appreciation may well conclude: "The pre-eminence of the Banksian Herbarium has not been established so much by its extent or the number of celebrated ones incorporated with it as through the matchless skill and talents of those who have superintended the determination of the specimens and assisted in collating the whole with the Herbarium of Linnæus. To which we may add the having been passed in review by most of the eminent botanists of the day, by whom it has been resorted to from all parts as the touchstone for the essay of the synonymy of their intended works, and who have attested their presence by various suggestions and corrections on its leaves."

[APPENDIX.—The following remarks, derived from the records of the British Museum, are appended by the President, by permission of the Trustees.]

SIR JOSEPH BANKS was a very active Trustee of the British Museum, and the extent of his interest and influence is shown by the diary of Mr. Charles Koenig, who was at first Assistant-Keeper, afterwards Keeper, of the Natural History Department of the Museum during the last decade of Sir Joseph's life. In this diary there are numerous references to consultations with Sir Joseph Banks and the confident acceptance of his advice. A few extracts will illustrate the diversity of the subjects with which he was concerned.

On July 13th, 1810, Mr. Koenig records that he has discussed with Sir Joseph the arrangement of the Greville Collection of minerals, just acquired by the Museum, and has devised a satisfactory plan. He adds that this "may be deemed preferable to the scheme lately proposed by M. de Bournon, of forming two collections of the same kind, the one for the man of science and the other for the stupid gaze of the visiting vulgar."

On November 22nd, 1814, "Sir J. Banks came to examine into the state of the insect room."

Early in 1815, Mr. Koenig began to improve the exhibited collection of fossils, and proposed that he and Mr. Baber should visit Germany to purchase specimens. On February 10th, 1815, the proposal was sanctioned, and Mr. Koenig was ordered to wait upon Sir Joseph Banks for his instructions.

Important fossils and minerals from foreign countries were continually sent to Sir Joseph Banks, who passed them on as gifts to the Museum. A jaw of *Mosasaurus*, from the Dutch anatomist, Dr. Peter Camper, was given in 1784, and this was followed by other specimens until, in 1815, some remains of the mammoth from Siberia, sent by the emperor of Russia, completed an important series of additions. Sir Joseph then asked

the Trustees for a duplicate pair of horns of the "Irish Moose" in exchange for his many benefactions, and the request was at once granted.

The possible increase of the natural history collection by exchanging duplicates then attracted the attention of the Trustees, and on January 13th, 1817, they gave to Mr. Koenig "permission to exchange specimens" provided that in each case he first obtained "the approbation of Sir J. Banks."

On December 12th, 1817, Mr. Koenig recommended the Trustees to purchase the pioneer geological collection of William Smith, and assured them that he had discussed the subject with Sir Joseph Banks, and "availed himself of Sir Joseph's superior insight into these matters."

The last reference is dated February 19th, 1820, when Sir Joseph presided over a small sub-committee at his house to consider the stuffing of animals.

Zoology, palaeontology, geology, and mineralogy thus equally came within Sir Joseph's sphere, and he also dealt with the problems of museum technique.



PROCEEDINGS  
OF THE  
LINNEAN SOCIETY OF LONDON.



133RD SESSION.

FROM NOVEMBER 1920 TO JUNE 1921.

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## Journal, Botany.

Vol. XLV.	No. 301.	20/-
	.. 302.	9/-
	.. 303.	26/-

## Journal, Zoology.

Vol. XXXIV.	No. 228.	14/-
	.. 229.	20/-

## Transactions, Zoology.

Vol. XVII. Part 4.	12/-
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Proceedings, 132nd Session, January 1921. 6/-

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List of [Fellows, Associates, and Foreign Members], Nov. 1920.

# PROCEEDINGS

OF THE

## LINNEAN SOCIETY OF LONDON.

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(ONE HUNDRED AND THIRTY-THIRD SESSION,  
1920-1921.)

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November 4th, 1920.

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 24th June, 1920, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Mr. Herbert William Pugsley, B.A. (Lond.), Mr. Raymond Alfred Finlayson, and Mr. Howard Hamp Crane were admitted Fellows.

New Certificates, in favour of the following, were read:—  
Keppel Harcourt Barnard, M.A. (Cantab.), Rev. Prof. John Fernand Caius, S.J., Ph.D., Major Arthur Dorrien-Smith, D.S.O., Albert Edward Mills, F.C.S., M.P.S., Samuel Lyon, F.R.G.S., Sydney Cross Harland, D.Sc. (Lond.), Charles Coltman-Rogers, Samuel Gordon Smith, Henry Ball, Capt. Bertram Hammer Bunbury Symons-Jeune, Arthur Mayfield, Mrs. Bella Dytes MacIntosh MacCullum, M.A., D.Sc. (N.Z.), and William John Phillipps.

The President announced that there were now eight vacancies in the Fellows' list, and that the next ballot to fill these would be taken on the 9th December next.

The Treasurer showed the recently acquired volumes purchased by means of the Tagart Bequest, and commented on the use of buckram in place of leather.

The first communication was by Mr. J. H. OWEN, M.A., entitled "Further researches into the Life and Habits of the Sparrow-Hawk, *Accipiter nisus* (Linn.) Pall."

After preliminary remarks on some of the less-known habits of the Sparrow-Hawk, Mr. Owen showed a series of nearly 80 lantern-slides depicting various incidents of the incubation and nestling periods. The slides were from photographs of six different nests. Of special interest were series showing:— (1) The efforts of the hen to protect the nestlings from the effects of the sun; (2) The behaviour of the hen during incubation as affected by climatic conditions.

An animated discussion followed, in which the following engaged:—Mr. Harold J. H. Russell, Lt.-Col. J. H. Tull Walsh, Mr. Seth Smith (visitor), Mr. C. E. Salmon, Dr. W. Rushton Parker, and Miss Gulielma Lister, the lecturer replying to the various questions put.

The communication concerning the benefits to naturalists from the operations of the National Trust, announced for this meeting, was postponed to a later date.

The last communication was brought forward by Mr. H. N. DIXON, M.A., entitled "The Mosses of the Wollaston Expedition to Dutch New Guinea."

The mosses were unfortunately not described with the higher plants, but have since been worked out by the author, and have proved of great interest. Although consisting of only some 60 gatherings, the collection contained types of at least two new genera, *Hymenodontopsis* and *Callistomium*, and more than a dozen new species, including two new species of *Dawsonia*, a genus which is more highly represented in New Guinea than in any other part of its rather limited distribution.

A further collection by the Rev. J. B. CLARK, of the London Missionary Society, in the neighbourhood of Boku, British New Guinea, is also included, and contains ten new species, including a very beautiful *Pterobryella*, and other interesting things. A small species, probably of *Rhizogonium*, named provisionally *R. orbiculare*, may possibly represent the ancestral form of the Rhizogoniaceae.

Specimens of certain of these were exhibited, and also lantern-slides, some being photographs and others specimens, mounted as slides, of the mosses themselves.

Dr. A. B. Rendle, F.R.S., Sec.L.S., and Mr. Edmund G. Baker contributed further remarks, and the author replied.

November 18th, 1920.

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 4th November, 1920, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Mr. Joseph Omer-Cooper and Prof. Otto Vernon Darbishire, Ph.D., were admitted Fellows.

Certificates, in favour of the following, were read for the second time:—Rowland Maurice Richards, M.B.E., Louis Blaise, Vicomte de Sibour, F.Z.S., Rustom Hormasji Dastur, B.Sc. (Bombay), John William Bodger, M.P.S., Vedaranyesvara Vaidyanatha Ramana-Sastrin, Ph.D., Lieut.-Col. Anthony Wolley-Dod, George Peddie Miln, J.P., Henry Baker Lacey, Miss Ethel Spratt, D.Sc., Keppel Harcourt Barnard, M.A. (Cantab.), The Rev. John Fernand Caius, S.J., Ph.D., and Major Arthur Dorrien-Smith, D.S.O.

Prof. E. S. GOODRICH, F.R.S., read his paper "On a new type of Teleostean cartilaginous Pectoral Girdle found in young Clupeids."

The President and Mr. R. H. Burne added further remarks, and Prof. Goodrich replied.

Dr. J. C. WILLIS, F.R.S., F.L.S., followed with his lecture on "Endemic Genera in relation to others," showing numerous lantern-slides in elucidation of his remarks, abstracted as follows:—

In a paper of 1916 the deduction was made that, in general, endemic species of small area were not relics, but species in the early stages of spreading, and much evidence has since been brought up to show the truth of this. It is now proposed to extend this deduction to endemic genera, and to endeavour to show that there is no appreciable difference between a local endemic and an allied genus of wide distribution (of course working always with groups of genera) other than age.

The case of the endemic genera of islands is taken for detailed illustration, and a prediction is made about the general composition of the list of such genera. In the first place, it is clear that such a prediction can only hope to be successful if the islands obtained the bulk of their floras by means of land communications; if their floras be really casual oversea migrants, one can hardly hope ever to predict it.

Now, if the endemic genera of islands be in reality survivals—the current view—one would expect that they would at least show a tendency to belong to families that are small or of broken distribution, *i. e.* such families as we have been accustomed to look upon as more or less moribund. And in any case, one would not expect the great bulk of them to belong to the large and “successful” families.

If, on the other hand, age and area hold good (including the extended deduction above given), then the endemic genera should be found to occur on islands in proportions not dissimilar to the proportionate sizes of existing families. And further, as on this view the larger families are in general the older in their affinity circles, we shall expect them to be rather better represented (proportionately) than the smaller.

In order to test this question thoroughly, I have added up all the endemic genera of all the islands in the world, and for comparison also those (1) of West Australia, South Africa, and Brazil (the mainland areas richest in endemics); (2) of Australia, Africa, and South America; and (3) of the World. Examination of the tables thus obtained soon shows that if one take the families in groups of ten in order according to the number of genera they contain in the world (*i. e.* beginning with *Compositæ* and ending with monotypic families), the proportion of island genera to the total is closely the same throughout the list, and the same holds for all the four areas mentioned. Thus the first ten families contain 40.1 per cent. of the genera of the world, 39.4 per cent. of those of Australia, Africa, and South America, 40.5 per cent. of those of West Australia, etc., and 38.3 per cent. (606 genera out of 1582) of the endemic genera of islands. And the approximation is equally close all down the scale, so that the curves produced almost coincide.

Comparison shows with equal clearness that the proportional representation among the endemic genera of islands decreases as one goes down the scale. The first 100 families in the world have island endemic genera in 92, the genera being 12.9 per cent. of the total genera in the families. The intermediate 92 families are represented by 45 only, with 9.28 per cent. of their genera, and the last 100 by 13 with 8.72 per cent.

The second prophecy made above is thus fully borne out by the facts. Various pieces of confirmatory evidence are also given.

A discussion ensued in which the undermentioned took part:—  
Dr. A. B. Reudle, F.R.S., Sec.L.S., Lt.-Col. J. H. Tull Walsh,  
Dr. R. R. Gates, and Mr. C. C. Lacaita, the author replying.

December 9th, 1920.

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 18th November, 1920, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Mr. William Harold Pearsall, M.Sc. (Manch.) and Mr. Tom Russell Goddard were admitted Fellows.

The following certificates were read for the second time :—Mr. Albert Edward Mills and Mr. Samuel Lyon.

The following were proposed as Fellows :—Herbert Sutcliffe, A.R.C.S., Edward Jocelyn Wortley, M.B.E., F.C.S., William Small, M.B.E., M.A., B.Sc., William Frederick Bumsted, F.R.M.S., and Reginald Ernest Massey.

The following were elected Fellows :—Rowland Maurice Richards, M.B.E., Louis Blaise, Vicomte de Sibour, F.Z.S., Rustom Hormasji Dastur, B.Sc. (Bombay), John William Bodger, M.P.S., Vedaranyesvara Vaidyanatha Ramana-Sastrin, Ph.D., Lient.-Col. Anthony Wolley-Dod, George Peddie Miln, J.P., Henry Baker Lacey, Miss Ethel Spratt, D.Sc., and Major Arthur Dorrien-Smith, D.S.O.

The President stated that Prof. R. NEWSTEAD, F.R.S., A.L.S., was unable to deliver his lecture on Uganda biology as announced, but hoped to give it at a later date.

Prof. E. S. GOODRICH, F.R.S., Sec.L.S., gave a demonstration of the Hymenopterous Parasites of grain-infesting Insects, under a series of microscopes.

The second communication was by Mr. L. V. LESTER-GARLAND : "Plants from Darfur collected by Capt. Lynes, R.N., with remarks on their Geographical Distribution," and was illustrated by a selection of the plants themselves and photographs of the district.

The discussion which followed was carried on by the President, Dr. A. B. Rendle, F.R.S., Sec.L.S., Mr. C. C. Lacaita, Mr. E. G. Baker, and Mr. T. A. Dymes, the author replying.

The last communication was by the General Secretary : "The Norseman in Canada in A.D. 1000, with the plants they reported."

He explained that his remarks were limited to the introductory part of a lecture prepared four years previously, which had been postponed delivery. Starting from the paper read by Dr. Fridtjof Nansen before the Royal Geographical Society on the 6th November, 1911, he quoted from recent papers by Daniel Bruun and H. P. Steensby in 'Meddelelser om Grønland,' vols. xvi., xvii. in 1918, and a slight sketch by Prof. H. O. Juel, in the current volume of the 'Svenska Linné-Sällskapetets Årsskrift,' p. 61. The

course followed by the Norsemen was narrated, from their colonies in Greenland across Davis Strait, to the North-east coast of Labrador, southward through Belle Isle Strait to the valley of the St. Lawrence, and the tract of country on its right bank, where vines were found growing, unsown corn, and a tree called 'Masur,' these being regarded as *Vitis Labrusca* L., *Zizania aquatica* L., and an *Accr.* The reasons why these voyages were not continued were explained as due to the weak colonies at that time in Greenland, the actual starting-point, and the opposition of the natives, termed 'Skrællings,' who prevented any attempts at settlements in 'Vinland'—the Wineland of the sagas of Erik the Red, and of Thorfinn Karlsefni,—the northern part of New Brunswick.

Mr. C. C. Lacaita and Sir Henry Howorth, F.R.S. (visitor) spoke, the latter commenting upon the interest of the communication, the extraordinary hardihood and endurance of the Norsemen in their hazardous and long voyages, also the differences between the war-ships and fishing-vessels of the time.

January 20th, 1921.

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 9th December, 1920, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

New Certificates, in favour of the following, were read:—Prof. Rajkumar Sen, M.Sc., and Prof. Sadao Yoshida, D.Sc.

The Certificates in favour of the following were read for a second time:—Sydney Cross Harland, D.Sc. (Lond.), Charles Coltman-Rogers, Samuel Gordon Smith, F.E.S., Henry Ball, Capt. Bertram Hammer Bunbury Symons-Jenne, Arthur Mayfield, Mrs. Bella Dytes MacIntosh MacCallum, M.A., D.Sc., William John Phillipps, Herbert Sutcliffe, A.R.C.S., Edward Jocelyn Wortley, M.B.E., F.C.S., William Small, M.B.E., M.A., B.Sc., William Frederick Bumsted, F.R.M.S., and Reginald Ernest Massey.

The President announced that the next Ballot for Fellows would take place on the 3rd March. The following four Candidates are placed according to seniority, four vacancies having to be supplied:—Keppel Harcourt Barnard, M.A. (Cantab.), The



Rev. John Fernand Cairns, S.J., Ph.D., Albert Edward Mills, F.C.S., and Samuel Lyon, F.R.G.S.

Mr. E. H. C. WALSH, I.C.S. retired, delivered a Lecture on "Lhasa and Central Tibet," illustrated by thirty-one lantern-slides from his own photographs.

The Lecturer gave a brief description of the country, the people, the religion, and the Government. The Tibetans call their country Pö (Bod) and themselves Pö-pa; the name Tibet is from Tö-Pö (Stod-Bod), which means "High Tibet," applying to the central tableland. The country extends 1600 miles in its greatest breadth and 800 miles in its greatest width from the Koko Nor to the southern bend of the Takiang or Blue River; the superficial area is more than a million square miles, and comprises the highest portion of the earth's surface, and is bounded on its southern frontier by the Himalayas, the loftiest chain of mountains in the world. The Lake region lies to the north, and the River region encircles it on three sides—west, south, and east; the former region is very dry, and cold; the River region contains the sources of many rivers, such as the Indus, Sutlej, Brahmaputra, Salween, Mekong, Yantse-Kiang, and Hoang-ho. The great plain known as Chang-Thing is 500 miles wide at its greatest width and mostly uninhabited except by nomads; the mean altitude is over 16,500 feet, the peaks 20,000 to 24,000, the passes 16,400 to 19,000, and the valleys 14,500 to 17,400. Vegetation is almost non-existent. The crescent, which partly encircles the plain, is inhabited by Tibetans; the central portion of the great plain is for the most part unexplored.

The slides showed natural features, as the frozen waterfall Dotag, as an instance of the intense cold at the high altitudes, yaks, people of various degrees, their houses and prayer-flags, Lamas and their monasteries, boats, and shrines.

In the discussion which followed, the President referred to the interest of the Tibetan elevation as one of the newest physical features of the earth's crust. Numerous remains of rhinoceros had been found in the Hundes region, and Hugh Falconer supposed that that part must have been raised about 8000 feet since Pliocene times, when the large quadrupeds lived there. According to certain American theories, the rise of the Himalayas may have isolated a northern tract of the great Indian forest which was inhabited by several great apes during the Miocene period. The new inclement conditions might so affect the life of the apes in this isolated northern tract as to drive them to the plains and thus originate man.

Sir Nicolas Yermoloff, K.C.B., remarked that there were many Lamas amongst the Siberian soldiers in the Russian troops.

Mr. H. J. Elwes, F.R.S., referred to Sir Joseph Hooker's statement (*Himal. Journ.* ii. 150) that the yak bred once in two years, and asked if that were correct, as no other traveller seemed to have noticed it.

Mr. C. C. Lacaita pointed out that all the people shown on the screen were exclusively men, and asked if the women were secluded, he also enquired as to the prevalence of polyandry, especially in the higher classes. He appreciated the buttered tea of the Tibetans as a restorative.

The Lecturer replied to the questions put: he could say nothing about the yaks in the matter of their breeding; that women were not secluded, and that it was only by chance that the selected slides showed none.

February 3rd, 1921.

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 20th January, 1921, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Mr. Henry Baker Lacey and Mr. John William Bodger were admitted Fellows.

Certificates in favour of the following candidates were read for the second time:—Prof. Rajkumar Sen, M.Sc., and Prof. Sadao Yoshida, D.Sc.

The President announced vacancies in the list of Foreign Members, through the deaths of Dr. Franz Steindachner, Prof. Wilhelm Pfeffer, Prof. Yves Delage, Dr. Odoardo Beccari, Prof. Alfred Gabriel Nathorst; and a vacancy in the list of Associates, through the death of John Reader Jackson.

Dr. ANNIE PORTER, F.L.S., and Prof. H. B. FANTHAM exhibited a specimen of a new flagellate found in the blood of a bony fish, *Dentex argyrozona*, occurring in Cape waters. The flagellate has been named *Herpetomonas denticis*. It is unusual to find such flagellates in the blood of Vertebrates, but similar flagellates occur in the alimentary tract of Insects and a few other Invertebrata. The significance of the occurrence of *Herpetomonas* in Vertebrates is interesting, as a resting form of such a flagellate may occur in man in India, Mediterranean countries, and South America, giving rise to serious diseases such as Kālā-ázár and other Leishmaniasis. The occurrence of such flagellates suggests the possible evolution of Leishmaniasis from parasites in the gut of blood-sucking insects or other Invertebrates becoming able to live in the blood of

Vertebrates, such as man. The *Herpetomonas* found in *Dentex*, however, does not appear to be markedly pathogenic.

Prof. E. S. Goodrich, Sec.L.S., having spoken, Lt.-Col. Tull Walsh observed that the specimen shown will be of great interest to the medical profession. Besides the *Leishmania tropica*, which it resembles, we have *L. donovani*, the cause of Kálá-ázár, a very deadly disease in Eastern Bengal, Assam, etc. In this disease only the ovoid form of *Leishmania* exists, in man. Sir Leonard Rogers was, however, years ago, able to cultivate the flagellate form. Both forms exist in the fish mentioned by Dr. Porter. The flagellate form of *L. donovani* is so like a flagellate found in *Nepa cinerea* that the latter can be used in England to illustrate, for teaching purposes, the flagellate form of *L. donovani* occurring in subtropical countries, in cultures from the form found in man.

Mr. MILLER CHRISTY, F.L.S., followed with his communication on "Wistman's Wood," supplying the abstract here printed:—

Wistman's Wood is a small unique grove of ancient, and exceedingly gnarled and diminutive, oak trees (all *Quercus pedunculata*), growing out of an extensive pile of huge angular blocks of granite (known locally as a "clatter"), without a particle of visible soil. The wood is hung (so to speak) upon the steep left bank of the West Dart, about two miles north from Two Bridges, almost in the centre of Dartmoor, and at an elevation of about 1500 feet. Its area is small (about 5-6 acres at the outside), and the number of trees comprised in it is probably not more than from 300 to 400, in spite of statements to the contrary.

Wistman's Wood is not a remnant of a primæval forest which once covered Dartmoor, for none such can ever have existed. It may be, however, the only survivor of other similar groves which once occupied some of the deeper and more sheltered valleys. It owes its continued existence, beyond question, solely to the "clatter" of granite blocks out of which it grows; for this protects it, not only from fire, but also from all animals grazing on the moor; these being unable to cross it, owing to the steepness of the slope and the crevasse-like open spaces between the great masses of rock, which are piled together in great confusion. For the same reason, access to the wood is, even for human beings, a climb or scramble, rather than a walk; while, within the wood itself, progress is even dangerous, owing to the crevasses being hidden by an abundant growth of moss, many tussocks of *Luzula sylvatica*, and other herbage.

The oaks (with which grow two or three bushes of *Pyrus Aucuparia*, but no other kind of tree) are all exceedingly dwarfed. Their average height is, perhaps, 10 feet, the highest not exceeding 15 feet. Many are of bushy or scrubby habit, presenting no definite stem, and few (if any) have a stem 4 feet high. In the case of adult trees, presenting measurable stems, the average circumference ranges from 40-60 ins., but one measured reached 78 ins.

Yet these toy-like oaks are unquestionably of great age—probably well over 500 years—as has been proved roughly by cutting sections in order to count the number of concentric (annual) rings. This has been done on several occasions; but the results have not been conclusive, owing chiefly to the narrowness and closeness of the rings, due to extreme slowness of growth, from the hard conditions under which the trees exist.

The trees are remarkable also, apart from their small size, by reason of their fantastically-gnarled and twisted branches, reminding one strongly of the tiny Japanese trees grown in pots for decorative purposes. A feature still more unusual (at any rate, so far as oaks are concerned) is the extent to which even the topmost branches of the older trees are overgrown by huge masses of moss, long shaggy lichen, and the common *Polypodium vulgare*, giving them an enormously bulky appearance. The interior of Wistman's Wood presents, indeed, an altogether strange and weird aspect, as seen from photographs shown, believed to be the first of their kind taken. Yet, in spite of many statements to the contrary, the trees appear healthy (there being none either dead or dying). Moreover, they produce acorns, though few in number; there are also young trees.

The Wood has long been known, and there have been many notices of it in print. The earliest was, probably, that of Tristram Risdon, written just three centuries ago, which shows the wood to have been then almost exactly the same, in all respects, as now. The others (which include an "Ode" to the wood) are, for the most part, too incorrect, or too pervaded by ideas of "Druids" and "Pyxies" as inhabitants of the wood, or too tinged with poetic fancy, legend, and superstition, to present many points of scientific interest. The present is believed to be the first adequate description of the wood.

Wistman's Wood, though it belongs to the Duchy of Cornwall, ought to be scheduled under the Ancient Monuments Act or placed under the protection of the National Trust.

A discussion followed: Dr. D. H. Scott referred to the annual rings, enquiring whether the author had observed two rings in a year, when the original show of leaves had been devoured by caterpillars, but renewed from the midsummer shoot. Mr. D. J. Scourfield (visitor) remarked that the Japanese trees were dwarfed in some measure by special pruning, and that the oaks in Wistman's Wood were self-pruned. Mr. H. N. Dixon hoped that some local society would study the flora of this Wood from an ecological point of view; he compared the growth in this case to rain-forest in the temperate zone. Dr. E. J. Salisbury pointed out that the native oak-woods are composed of *Quercus sessiliflora*. Mr. C. C. Lacaita enquired if the acorns were plentiful; in the Western Highlands the oaks produced but few acorns. Mr. Miller Christy replied briefly.

Mrs. AGNES ARBER, D.Sc., F.L.S., gave an account of her paper "On the Leaf-tips of certain Monocotyledons."

Dr. D. H. Scott and Dr. A. B. Rendle, Sec.L.S., contributed further remarks, the author replying.

The last paper, "Seeding and Germination of *Ruscus aculeatus*, Linn.," was explained by Mr. T. A. DYMES, F.L.S., as shown in the following abstract. He stated that in the South-Eastern quarter of England the berries and seedlings perish by severe frost although the adult is hardy. Many seeds fail to germinate, because immature. Germination begins in July or August with the extrusion of the radicle; the cotyledon remains within the endosperm. During the first season the plumule is merely a short axis, completely invested by scale-leaves; it remains underground from the close of the first season until the following summer. Frost kills many seedlings during the first winter. Better results are obtained by sowing, as soon as the seeds are ripe, at a depth of one inch than at a greater depth or in the spring. Survivors in the second season produce an axis some three inches long, bearing a few scale-leaves and, at the apex, about six phylloclades in the axils of scale-leaves, which are longer than those of the adult. The radicle perishes, and adventitious roots are produced of about five inches in length. During the second winter the seedlings are unable to withstand severe frost. There is no recapitulation of the ancestry by the seedling.

Mr. E. G. Baker, Mr. C. C. Lacaite, and Mr. E. Step took part in the discussion, the author replying.

February 17th, 1921.

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 3rd February, 1921, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Mr. William Henry Kitching and Prof. William Grant Craib, M.A., were admitted Fellows.

The following were proposed as Fellows:—William Edward Hollows, M.P.S., Santi Prosad Sen Gupta, B.Ag., Shanker Ganesh Sharngapani, B.Ag., Donald Ward Cutler, M.A., and John Noel Milsum.

Dr. RENDLE read a communication from Prof. GIOVANNI BATTISTA DE TONI, F.M.L.S., entitled "A Contribution to the Teratology of the Genus *Datura* L."

A discussion ensued, in which Mr. W. R. Dykes, Lt.-Col. J. H. Tull Walsh, and Dr. G. C. Druce took part.

Capt. J. RAMSBOTTOM then spoke on a collection of Macedonian plants made by various members of H.M. Salonika Forces. The first numbers gathered in the autumn of 1917 proved of great interest, and the preliminary idea of making as complete a collection as possible was therefore persisted in. An attempt was made to direct the interest in Natural History subjects that was encountered when giving talks on Botany in hospitals and Y.M.C.A. huts. Use was also made of the 'Balkan News,' the daily paper published for the troops, in order to point out the great value of a proper investigation of the flora of Macedonia and also to give full directions as to how best to collect and to dry plants. Permission was obtained from the Commander-in-Chief to hold a plant-collecting competition amongst Warrant Officers, non-commissioned Officers, and men, the conditions of the competition being published in General Routine Orders, and thus reaching every member of the Force.

The result of the competition, having regard to the hazards of active service, was satisfactory, as it also had the effect of centralizing effort and attracting a considerable number of other collectors.

The districts in which the principal collectors were stationed were indicated on a map, and lantern-slides were shown illustrating the different types of country met with in Macedonia.

Mr. A. J. WILMOTT, who followed, pointed out that the main interest of the collection, apart from the value of the material from this little-known region, lay in the features of endemism which the Macedonian flora exhibited. Endemics are said to be both numerous and abundant, which seems to be true so far as one can judge in a poorly explored area. It was suggested that one of the first duties of the student of distribution should be to discover and delineate natural floristic areas, the next duty being to convert taxonomists to using them. It must be emphasized that the general custom of using political boundaries completely obscures the essential facts and is entirely unnecessary, since all areas whose floristic relations are doubtful can be kept separate until their flora is known, when the relationships should be obvious. To draw no distinction between localities in Bulgaria north of the Balkan ridge and those (in "Thrace") south of it, does not permit distributional features to be obvious unless one is very well acquainted with the topography of the country. Natural areas in the Balkans were shown on a sketch-map. Further, the ultimate topographical subdivisions should be twofold, one by river basins for lowland species, the other by hill

masses for the upland species, for the barriers to distribution are diverse in the two cases.

The features of endemism are also obscured by superficial or bad identification, for not only is the presence of an endemic form hidden, but the more restricted distribution of the commoner species is also obscured, an equally troublesome matter since the limits of distribution are the important point to determine, no matter whether the limits are narrow or wide. When one finds that a writer has only casually determined many plants recorded, he is forced to distrust all records which are not verified by actual specimens of the form carefully recorded from all sides of the locality in question. As this is often difficult to do in a single herbarium, the element of doubt becomes painfully large in some cases. Adamović's determinations are often bad: Velenovský's work is more careful but still insufficiently critical. One has to revise each of his statements before accepting it, a matter difficult to do with the insufficient material in this country. Boissier is out of date: great numbers of new species have since been described from the Balkans, making a large mass of undigested and often untraceable pamphlet material. It is therefore unsafe to frame theories of Balkan endemism at present, but some hypotheses were offered for consideration.

Of the 4000 or so sheets of the collection less than a quarter has been determined in more than a year: but numerous errors and confusions have been cleared up, as the material available is from a relatively small area and sufficient in most cases for serious study. It is a great pity that no serious collection was made between Vodena and Ostrovo, the type locality for many of Grisebach's species.

A series of the specimens of interest was exhibited, including several forms believed to be new to science.

It was pointed out that *Silene juvenalis* (= *S. subconica*) is a common plant in Macedonia, and that its occurrence on the reopened silver mines at Laurion, in Greece, is not surprising. Heldreich's suggestion that it had sprung up from seed which had been dormant 1500–2000 years may be dismissed. *Glaucium Serpieri*, Heldr., of which the same was postulated, is not most nearly related to an Asia Minor or Persian form, but is either a variety of *G. flavum* as Halácsy places it, or a local or endemic form. It deserves more critical study.

Dr. Rendle considered this collection as the best of all service collections, resulting in so large an accession of specimens for the British Museum. It was of great importance as allowing a fairly intensive study of a definite area.

Mr. C. C. Lacaita referred to the splendid preparation of the specimens, so important for study in the herbarium. He also mentioned that round Athens *Anemone fulgens* was abundant; farther north various colours were prevalent, and that seeds of the latter had in his own garden yielded during many years the

varied tints in question, though, owing to the less brilliant sunlight, they were not so striking as in their native country.

Mr. W. B. Turrill (visitor) related his experience of various areas when on service in much the same tract of country.

Capt. Ramsbottom and Mr. A. J. Wilmott briefly replied.

Dr. G. CLARIDGE DRUCE next gave a short account of botanical work in the Shetlands, and showed a *Plantago* from the north of Balta Sound, which seemed so distinct from the surrounding *P. maritima*, *P. lanceolata*, and *P. Coronopus* as to be worth discrimination; it may be compared to *P. maritima* var. *minor* Hook., renamed by Boswell Syme as var. *hirsuta*. He also showed other plants gathered in July and August 1920, enumerating *Cerastium subtetrandrum* Murb., *Potamogeton suecicus* C. Richt., *P. rutilus* Wolfg., *Rhinanthus borealis* Druce, and *Poa irrigata* Lindm., as new to the flora.

A short time spent in the Orkneys with Col. H. H. Johnston resulted in adding two plants to the Scottish flora—*Nitella nidifica* Ag. in the Loch of Stenness and *Chara canescens* H. & J. Groves. (See p. 77.)

Mr. E. G. Baker considered that the specially noted *Plantago* did not materially differ from the variety *hirsuta* of Syme, in which opinion Mr. H. W. Pugsley joined.

Mr. C. C. Lacaita drew attention to the great interest of the plants occurring on the Serpentine formation, a remark which held good in the case of New Caledonian plants recently before the Society.

Dr. Druce replied, pointing out that *minor* was preferable to *hirsuta* on the score of earlier publication.

March 3rd, 1921.

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 17th February, 1921, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Dr. Ethel Rose Spratt was admitted a Fellow.

John Hyacinth Power, F.Z.S., and George Tertius Dickson were proposed as Fellows.



Prof. John Merle Coulter, Dr. Samuel Garman, Prof. Giovanni Battista Grassi, Prof. Louis Alexandre Mangin, and Prof. Jean Massart were proposed as Foreign Members.

Certificates, in favour of the following, were read for the second time:—William Edward Hollows, Santi Prosad Sen Gupta, B.Ag., F.R.H.S., Shanker Gauesh Sharngapani, B.Ag., F.R.H.S., Donald Ward Cutler, M.A., and John Noel Milsum, F.R.H.S.

The following were elected Fellows:—Keppel Harcourt Barnard, M.A. (Cantab.), The Rev. John Fernand Caius, S.J., Ph.D., Albert Edward Mills, F.C.S., M.P.S., Samuel Lyon, F.R.G.S., Sydney Cross Harland, D.Sc. (Lond.), Charles Coltman-Rogers, Samuel Gordon Smith, F.E.S., Henry Ball, Capt. Bertram Hamner Bunbury Symons-Jeune, and Dr. Sadao Yoshida.

The President announced that Ballots would take place on the 5th May for Fellows and Foreign Members, and on the 16th June for Fellows.

Mr. R. T. GUNTHER exhibited and spoke on certain Manuscripts in the Library of Magdalen College, Oxford, the following being an abstract of his remarks:—

The Manuscripts exhibited were all bequeathed to Magdalen College, Oxford, by JOHN GOODYER with his botanical library in 1664. Goodyer had not been a member of the College himself, but knew it through his father having been a tenant of a College farm at Alton (where John Goodyer was born), and through his brother-in-law, William Yalden of Sheet, who acted as one of the College bailiffs and clerk of the account, and also through his heir and nephew, Edmund Yalden, who became a Demy and Fellow of the College.

The Manuscripts, bound in Goodyer's time, include his own translations of Theophrastus and Dioscorides into English; the latter has not been undertaken by any other scholar either before or since. One volume contains a long list of Grasses with their synonyms and short descriptions, descriptions of various plants copied from Lobel's MSS. (now lost?), and an Index of Plants in Goodyer's hand, an Index to Gerard's Herbal (1597) and Stonehouse's Catalogue of plants growing in his garden at Darfield in 1640. The loose papers recently sorted and bound comprise a part of the MS. material for Lobel's projected work, *Stirpium Illustrationes*, now bound in three parts, the first of which, containing the descriptions of 223 species of Grasses, has been bound in a cover which appears to have originally held notes *De Febribus* by Lobel's master, Rondelet; a volume of the leaves from which How's selection from Lobel's '*Stirpium Illustrationes*' was printed in 1655; this is a relic of the highest interest, typographical as well as botanical, and because it contains Lobel's original

imprimatur signed by the President of the College of Physicians and other members, an original letter from Argent to Lobel, and How's own animadversions, on Parkinson. Two other volumes contain a Synonymy of Plants, used by Goodyer, and the remains of a small Hortus Hyemalis in which ferns and mosses were preserved. Goodyer's miscellaneous papers quite bear out the high reputation in which he was held by his contemporaries—Johnson, Merrett, Parkinson, etc. They include dated descriptions of some 90 new or rare species of plants either collected by him or flowered in his gardens; early lists, of plants grown in the gardens of William Coys in Essex in 1616, which is, therefore, the second English garden-list known; of Franqueville, Gibbs, Parkinson, and probably in his own garden at Droxford, Hants, where he lived until he moved to Petersfield on his marriage. It is hoped that it may soon be possible to print this and much other personal detail relating to Goodyer and his contemporaries.

By the kindness of Mrs. Ruck-Keene, a portion of a deed relating to Goodyer's connection with a Bramshott property was also exhibited.

The President having commented on the interest of the communication, invited discussion.

Mr. C. C. Lacaïta stated that his interest in John Goodyer dated from his own investigation into the history of the Jerusalem Artichoke. Goodyer was stated to be of "Mapledurham," which was not the Mapledurham on the Thames above Reading, nor Mapledurwell in Hampshire, but the Manor of Mapledurham near Petersfield in Sussex.

Dr. D. H. Scott, F.R.S., and Mr. James Britten having continued the discussion, the latter quoting from his investigations of the Sloane collections in the British Museum (Natural History), the General Secretary congratulated the author on his discovery that Mr. "Coel," Lobel's son-in-law, was identical with Master James Cole, a London merchant mentioned by Gerard several times, always in commendation. The speaker had arrived at this conclusion some years previously, now confirmed by Goodyer's entries. He also pointed out that Lobel had another son-in-law, referred to as Ludovicus Myrens, apparently a London apothecary of repute, and named also by Clusius in his 'Exotica.' Thus Lobel must either have had two married daughters or a daughter who was twice married.

The second communication was by the General Secretary: "The benefits derived by Naturalists from the operations of the National Trust." He observed that upon the death of the Rev. Canon Hardwicke Drummond Rawnsley, on the 28th May, 1920, the subject occurred to him as eminently suitable for presentation to the Society, and was on the Agenda paper for the first meeting of the present session but was crowded out. He traced the history of the "National Trust for Places of Historic Interest or Natural

Beauty" from its foundation in 1894, with Canon Ravensley as the Hon. Secretary until his death. With him were associated Sir Robert Hunter, Solicitor to the Post Office, and Miss Octavia Hill, and with these admirable helpers the course of the Trust has been clearly set out. The speaker pointed out that the influence of these three Councillors was marked by the acquisition of properties (*a*) in the Lake District due to the Canon, (*b*) Hindhead, due to Sir Robert Hunter, and (*c*) the view-points in Surrey and Kent, to Miss Octavia Hill.

A series of 90 slides of properties was shown on the screen, the majority taken for the Trust, with 15 lent by Prof. Oliver. Special emphasis was laid upon the value of Wicken Fen in Cambridgeshire and Blakeney Point in Norfolk, now preserved by the help of this association from human desecration and destruction. The speaker ended with an appeal for additional members to the Trust to ensure still greater advantages to the public.

Mr. S. H. Hamer (visitor), Secretary of the National Trust, observed that one of the most troublesome of their tasks was to teach the public how to use these natural reserves, and not to destroy plants thoughtlessly. He thanked the Society for this opportunity of making known the operations of the Trust.

March 17th, 1921.

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 3rd March, 1921, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered, a special vote of thanks being accorded to Prof. C. S. SARGENT, F.M.L.S., for his generous gift of eight volumes issued by the Arnold Arboretum, including "The Bradley Bibliography."

Dr. Nelson Annandale was admitted a Fellow.

Certificates in favour of John Hyacinth Power, F.Z.S. and George Tertius Dickson, were read for the second time.

John Francis Donald Tutt, F.Z.S., and James Robert Ainslie were proposed as Fellows.

The Certificates in favour of Prof. John Merle Coulter, Dr. Samuel Garman, Prof. Giovanni Battista Grassi, Prof. Louis

Alexandre Mangin, and Prof. Jean Massart as Foreign Members, were read for the second time.

The first paper, on "The Vertebrate Fauna of Houtman Abrolhos Islands, West Australia," by Mr. W. B. ALEXANDER, communicated by Prof. W. J. Dakin, F.L.S., was epitomised by Prof. E. S. GOODRICH, F.R.S., Sec.L.S.

A discussion followed, in which Sir Sidney Harmer, K.B.E., F.R.S., and Dr. N. Annandale took part, Prof. Goodrich replying.

The second paper was by Prof. PIERRE FAUVEL, "Annélides Polychètes de l'Archipel Houtman Abrolhos, recueillies par M. le Prof. W. J. Dakin, F.L.S.," and by whom the paper was communicated.

The next paper was by Mr. F. CHAPMAN, A.L.S., "*Sherbornina*, a new genus of Fossil Foraminifera from Table Cape, Tasmania," which, like the previous paper, was read in title.

The last communication was by Miss E. L. TURNER, F.L.S., entitled "Some Birds from Texel," and illustrated by a long series of lantern-slides from her own photographs. The author devoted most of her attention whilst on the island of Texel to the avocets, ruff and reeve, godwit, and two species of tern, describing the habits of the birds observed, especially during the nesting period. The last slide showed "the glory of the sandhills," the dwarf *Rosa pimpinellifolia*, L.

Dr. W. R. Parker enquired if Miss Turner had observed a parent bird teaching its young its appropriate note, as he had witnessed in the case of the Lesser Black-backed Gull.

Mr. H. J. H. Russell asked if the bird-reserve on Texel was maintained by the State or by private endeavour.

Dr. N. Annandale enquired as to the food of the birds described.

In reply, Miss Turner stated that the three bird-reserves in Texel were kept up by the private generosity of the Dutch, and not by the State, and she found that appeals for maintaining the efficiency of the reserves were readily responded to most liberally.

April 7th, 1921.

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 17th March, 1921, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Dr. Sadao Yoshida and Mr. Charles Coltman-Rogers were admitted Fellows.

James Walter White and Thomas Hayton Mawson were proposed as Fellows.

Certificates in favour of John Francis Donald Tutt and James Robert Ainslie were read for the second time.

Certificates for five Foreign Members, proposed on 3rd March, were read for the third time.

The first communication was by Mr. HORACE W. MONCKTON, Treasurer and V.-P.L.S., entitled "On the Distribution of *Taraxacum erythrospermum*, Andrz., in the South-East of England."

The author explained that he had for some years noticed a small form of Dandelion with deeply cut leaves and red seed growing abundantly on a football ground at Wellington College, Berkshire. It belongs to a group of varieties named *erythrospermum*. The geological formation is Upper Bagshot Sand (Barton Beds). He had seen the same variety on the similar sandy soil of Puttenham Heath, Surrey (Lower Greensand), on the Thames Gravel near Old Windsor, Berks, and on walls at West Drayton and other places. It is not confined to areas of sand or gravel, for he exhibited specimens from the London Clay of Ashted Common, near Epsom, Surrey. He had also found the same variety on the North Downs at Ranmore Common, near Dorking, which is in the Chalk District. The chalk does not, however, form the surface at that place, there being a covering of some thickness of clay, sand, and stones (mapped "Clay-with-Flints"). The only example of the red-seeded variety which he happened to have seen growing actually on a chalk soil was in a field between Leatherhead and Headley, Surrey. It is a larger plant than his other examples and is determined by Dr. Druce as *T. lacistophyllum*, Dahlst.

A discussion followed, Mr. C. E. Salmon, who showed specimens from the Chalk and Lower Greensand of the Reigate district, the General Secretary, Mr. C. C. Lacaita, Mr. A. J. Wilmott, and Mr. E. G. Baker taking part, Mr. Monckton replying.

Next followed Mr. REGINALD A. MALBY, who gave his lecture "A miniature Alpine Garden from January to December," illustrated by a long series of lantern-slides, many of them coloured.

Amongst the objects thus shown may be mentioned *Saxifraga Burseriana*, *S. Grisebachii*, *S. Ströbrunji*, *S. longifolia*, *S. Cotyledon* var. *islandica*, *Anemone vernalis*, *A. sulphurea*, *Nymphaea Mooreana*, *Primula frondosa*, *P. denticulata*, *P. marginata*, *P. Julie*, *Iris sibirica*, *I. gracilipes*, *Campanula Allionii*, *C. pusilla*, *C. garyanica*, *Shortia galucifolia*, *S. uniflora*, *Petrocallis pyrenaica*, *Crocus speciosus*, *Narcissus Johnstoni*, *N. monophyllus*, *N. triandrus*, *N. minimus*, *Oxalis encephylla*, and *O. lobata*.

Dr. A. B. Rendle, Mr. C. E. Salmon, Mr. T. A. Dymes, Mr. C. C. Lacaita, Mr. L. B. Hall, Mr. G. W. E. Loder, and Mr. H. N. Dixon put questions to the Lecturer, who answered as follows. The slides were hand-coloured with aniline dyes, the only difficulty being in blending the tints; he had grown *Alchemilla alpina* in his garden for some years, but had discarded it as not interesting him; his garden at Woodford was 75 feet long and 25 feet wide, but its surface was much increased by the digging and throwing up of banks for the alpine plants; the slides shown were the result of several years' work; Lumière slides were not found useful; and, that *Anemone sulphurea* thrive with him when planted in a rooting space of two feet deep of decayed vegetable matter, with constant moisture and perfect drainage.

April 21st, 1921.

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 7th April, 1921, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Mr. Samuel Gordon Smith was admitted a Fellow.

Prof. Thomas Wibberley was proposed as a Fellow.

The Certificates in favour of Mr. James Walter White and Mr. Thomas Hayton Mawson as Fellows were read for the second time.

The Certificates in favour of the Foreign Members proposed on the 3rd March were read for the fourth time.

The election of Auditors was proposed from the Chair, and carried by show of hands as follows:—For the Council: Mr. G. W. E. Loder and Dr. E. J. Salisbury; for the Fellows: Mr. H. N. Ridley and Dr. W. T. Calman.

The President announced that there would be ballots for Fellows on the 5th May, and on the 2nd and 16th June.

Prof. R. NEWSTEAD, F.R.S., A.L.S., then delivered a lecture, entitled "Some Observations on the Natural History of the Upper Shiri River, Nyasaland." The Lecturer dealt with the common types of the flora and fauna of the Upper Shiri River. The flora was dealt with under three sections:—(1) The river and its banks, (2) the open "dambo" or savanna, and (3) the forest. As regards the flora of the river, attention was called to the plants forming the fringe of the sudd, namely *Pistia Stratiotes* and *Trapa bispinosa*. The width of the sudd in the river a little south of the lake Malombe was given as approximately thirty-seven yards on either side; the width, however, varied at different points. The banks of the river in places were clothed with a more or less dense vegetation, consisting of a few palms (species?), the Baobab (*Adansonia digitata*), *Kigelia* sp., with here and there the scarlet-flowered climber, *Combretum microphyllum*, etc. In the open dambo, during the dry season, the plants were nearly all resting. The commonest of the plants, however, was a species of *Asparagus* and an undetermined species of Leguminosæ. The forest proper is fringed on the river-side by Acacias of various species, of which flat-topped species predominated. Hereabouts the Candelabra, *Euphorbia granulidens* (?), was also very common. In the forest the tree most commonly met with was the Iron-wood, *Copaifera Mopane*. The Ebony (*Diospyros* spp.) was also fairly common, and so also was a species of *Parkia*.

Illustrations were shown of the giant climber, *Kickxia* sp., *Strophanthus Nicholsoni*, and *Adenium multiflorum*, the last-named plant being fairly common, and blossoming during the dry season.

In dealing with the insects, special reference was made to a highly protected species of Mantis (*Taracodes perloides*), and the common Tsetse-fly of the country (*Glossina morsitans*), the latter being the chief factor concerned in the dissemination of Sleeping Sickness in man.

Illustrations of the common Tree-frog, *Chiromantis verampelina*, were shown, and attention was called to its highly protective colour and pattern.

Seventy-eight species of birds were collected, and specifically determined. Among these, was a new and undescribed species of flycatcher (*Erythrocerus nyasæ*); large flocks of the beautiful and rare little lorikeet, *Agapornis Lilianæ*, were observed.

Photographs from life were shown of a large number of birds common to the region in question, supplemented by a collection of prepared bird-skins.

After the lecture, which was illustrated by a large number of lantern-slides, an animated discussion followed in which Lord Rothschild, Dr. A. B. Rendle, Sec.L.S., Lt.-Col. Tull Walsh, and Prof. E. S. Goodrich, Sec.L.S., took part. Replies to the various questions propounded were given by the lecturer, as to

whether infection could be carried by small mammals if the large ones were exterminated; the identity or difference between *Trypanosoma Brucei* and *T. rhodesiense*, the latter producing the worse attack; the sudd was generally marginal and attached, very rarely breaking off into detached islands loose in the stream; on the actual banks of the river, mosquitoes (*Mansonia uniformis*) abounded, but happily they did not travel inland.

May 5th, 1920.

DR. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 21st April, 1921, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Capt. Bertram Hamner Bunbury Symons-Jeune and Capt. Francis James Stayner were admitted Fellows.

Charles Taborn, F.R.H.S., and Walter Sydney Stevens were proposed as Fellows.

The following were submitted to the Ballot, and elected:—  
As Fellows: Arthur Mayfield, Mrs. Bella Dytes MacIntosh MacCullum, M.A., D.Sc. (N.Z.), William John Phillipps, Herbert Sutcliffe, A.R.C.S., Edward Jocelyn Wortley, M.B.E., F.C.S.; as Foreign Members: Prof. John Merle Coulter, Dr. Samuel Garman, Prof. Giovanni Battista Grassi, Prof. Louis Alexandre Mangin, and Prof. Jean Massart.

A vacancy in the list of Associates caused by the death of Robert Allen Rolfe was announced from the Chair.

Reports on collections from the Indian Ocean, for issue in the Society's 'Transactions,' Zoology, vol. xviii. at the cost of the Percy Sladen Trust, were read as follows, Nos. 2-9 being communicated by Prof. J. Stanley Gardiner, F.R.S., F.L.S.:—

1. Prof. A. DENDY, F.R.S., F.L.S.—On Hexactinellid Sponges.
2. Mr. C. G. LAMB.—Diptera: Asilidæ, Dolichopodidæ, etc.
3. Dr. HUGH SCOTT.—Coleoptera: Seydmanidæ, etc.
4. Mr. H. GEBIEN.—Coleoptera: Tenebrionidæ.
5. Dr. MAX BERNHAUER.—Coleoptera: Staphylinidæ.
6. Dr. HUGH SCOTT.—Coleoptera: Distribution of Staphylinidæ.
7. Mr. S. SCHENKING.—Coleoptera: Cleridæ.
8. Miss F. E. JARVIS.—Hydroids of the Western Indian Ocean.
9. Dr. C. J. VAN DER HORST.—Madreporaria: Agariciidæ.



Dr. Hugh Scott gave a *résumé* of Reports Nos. 2-7, and Prof. J. Stanley Gardiner summarized those of Miss Jarvis and Dr. van der Horst.

The President contributed further remarks upon the value and interest of the papers read.

Next followed a communication by Mr. E. R. SPEYER on "Insects in Relation to the Reproduction of Coniferous Trees," instancing the destruction of the cones of *Pseudotsuga Douglasii*, Carr., *Pinus ponderosa*, Dougl., and *P. echinata*, Mill., by various insects, whose ravages were shown on lantern-slides.

Prof. Goodrich, F.R.S., Sec.L.S., and H. W. Monckton, V.-P. & Treas.L.S., made further remarks on the subject.

Prof. W. J. DAKIN gave a comprehensive account of the expedition made under his leadership in 1913, of which some description is given in the Journal of the Society, Zoology, vol. xxxiv. (1919) pp. 127-180, and vol. xxxiii. (1916) pp. 85-100. The vertebrates were enumerated by Mr. W. B. ALEXANDER, and the Annelids by Prof. P. FAUVEL, in papers laid before the Society on the 17th March last. To these were now added papers by Prof. S. J. HICKSON, F.R.S., "On two Sea-pens," and by Dr. W. M. TATTERSALL on the "Amphipoda and Isopoda." Details regarding the latter papers were given by Prof. Dakin, who communicated them.

Prof. Dendy briefly commented on the results of the expedition.

May 24th, 1921.

*Anniversary Meeting.*

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 5th May, 1921, were read and confirmed.

Miss Winifred Mary Ailsa Lomas, B.Sc., and William Rae Sherriffs, M.A., D.Sc. (Aberd.), were proposed as Fellows.

Certificates in favour of Charles Taborn and Walter Sidney Stevens were read for the second time.

The Treasurer made his Annual Report on the Accounts of the Society, and the Statement (see pp. 26-28), duly audited, was received and adopted.

The General Secretary reported that since the last Anniversary the following had died or their deaths been ascertained, namely:—

## 21 Fellows.

John Gilbert Baker.	William Harris.
Francis Maule Campbell.	Rev. Manoah Holland.
George William Carter.	Dr. George Blundell Longstaff.
Albert John Chalmers.	Henry Felix Northcote.
Frederick Moore Clements.	Francis Edward Robotham.
Herbert Henry Corbett.	Henry Frederick Conrad
James Ramsay Drummond.	Saunders.
Henry Duckworth.	John Symons.
Capt. Harold Stuart Ferguson.	William Alexander Talbot.
Sir Charles Edward Fryer.	Rev. William Walter Watts.
Peter Goiffon.	Rev. Alexander Whyte.

## 2 Associates.

John Reader Jackson.	Robert Allen Rolfe.
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## 4 Foreign Members.

Odoardo Beccari.	Alfred Gabriel Nathorst.
Yves Delage.	Otto Bütschli.

That the following 16 Fellows had withdrawn:—

John Redman Bovell.	Thomas Vere Hodgson.
Edmund Burke.	Montagu Frank Hopson.
Capt. Malcolm Burr.	Rev. Edward Francis Linton.
George Francis Scott Elliot.	Thomas Steel.
Col. William Henry Wilson	J. G. Otto Tepper.
Elliot.	John Augustus Voelcker.
John Edward Griffith.	Henry John Waddington.
Rev. Albert Augustus Harland.	George Herbert Wailes.
James Peter Hill.	

And that the Council had removed the following from the List, in accordance with the Bye-Laws, Chap. II. Sect. 6:—

Rev. Henry Bride Barber.	Trailokya Nath Mukharji.
Charles Hall Betts.	Miss E. M. Evered Parsons.
Alfred Douglas Hardy.	John Gervaise Turnbull.
Mrs. Maude Maufe.	

During the same period 39 Fellows have been elected, of whom 34 have qualified up to the present. Also 5 Foreign Members have been elected.

The Librarian's report was read, showing that donations from private individuals and editors amounted to 107 volumes and 347 pamphlets and parts, by exchange 119 volumes and 682 detached parts, by purchase 64 volumes and 267 parts: in all, the accessions amounted to 290 volumes and 1296 pamphlets and separate parts.

Books bound amounted to 497: 4 in half-morocco, 47 in buckram, 183 in half-buckram, 142 in cloth, and 121 rebacked.

The General Secretary having read the Bye-laws governing the Elections, the President opened the business of the day, and the Fellows present proceeded to ballot.

The Ballot for the Council having been closed, the President appointed Dr. O. Stapf, Dr. J. R. Leeson, and Mr. A. W. Sheppard Scrutineers; and these, having examined the ballot-papers and cast up the votes, reported to the President, who declared the Council to be as follows:—

Prof. MARGARET BENSON, D.Sc.; \*Prof. V. H. BLACKMAN, F.R.S.; E. T. BROWNE, M.A.; HENRY BURY, M.A.; STANLEY EDWARDS, F.Z.S.; Prof. E. S. GOODRICH, F.R.S.; \*Dame HELEN GWYNNE-VAUGHAN, D.B.E.; \*Sir SIDNEY F. HARMER, K.B.E., F.R.S.; Dr. B. DAYDON JACKSON; C. C. LACAITA, M.A.; GERALD W. E. LODER, M.A.; HORACE W. MONCKTON, F.G.S.; REGINALD I. POCOCK, F.R.S.; \*Capt. JOHN RAMSBOTTOM, M.A.; Dr. A. B. RENDLE, F.R.S.; The Rt. Hon. LIONEL WALTER, BARON ROTHSCHILD, F.R.S.; Dr. E. J. SALISBURY; CHARLES EDGAR SALMON, Esq.; \*THOMAS A. SPRAGUE, B.Sc.; and Dr. A. SMITH WOODWARD, F.R.S.

(New Councillors are shown by an asterisk. The retiring Councillors were: Mr. E. G. BAKER; Prof. J. B. FARMER, F.R.S.; Capt. A. W. HILL, F.R.S.; Miss A. LORRAIN SMITH; and Lt.-Col. J. H. TULL WALSH.)

The Ballot for the Officers having been closed, the President appointed the same Scrutineers; and these, having examined the Ballot-papers and cast up the votes, reported to the President, who declared the result as follows:—

*President*: Dr. ARTHUR SMITH WOODWARD, F.R.S.

*Treasurer*: HORACE W. MONCKTON, F.G.S.

*Secretaries*: Dr. B. DAYDON JACKSON.

Prof. E. S. GOODRICH, F.R.S.

Dr. A. B. RENDLE, F.R.S.

The President then delivered an Address entitled "Observations on some Extinct Elasmobranch Fishes," which was illustrated by many lantern-slides (see p. 29).

## TREASURER'S ACCOUNTS FOR THE YEAR ENDED APRIL 30TH, 1921.

(Presented at the Anniversary Meeting, May 24th, 1921.)

*Receipts and Payments of the Linnean Society from May 1st, 1920, to April 30th, 1921.**General Account.*

	£	s.	d.		£	s.	d.
<i>Receipts.</i>				<i>Payments.</i>			
Balance at Bankers on 1st May, 1920.....	152	0	4	Taxes and Insurance .....			25 14 1
Cash in hand .....	6	9	11	Repairs and Furniture (includes Committee Room, £99 2 7) .....			207 3 6
Interest on Investments .....	359	6	11	Coal, Electric Current, and Gas .....			102 17 3
Admission Fees .....	252	0	0	Salaries .....			875 6 8
Annual Contributions .....	2187	0	0	<i>Library:—</i>			
Sales of Publications:—				Books (New Books £40 12 8) .....	£143	7	2
Transactions .....	£38	12	0	Binding.....	183	13	9
Journals .....	180	10	4	Expenses of Publications:—			327 0 11
Proceedings and Catalogues .....	2	13	0	Printing .....	£765	6	4
	221	15	4	Illustrations .....	113	2	5
Fellows' postal account, deposits .....	13	16	10	Distribution .....	34	13	10
Donations in aid of Publications .....	65	0	0	Miscellaneous Printing and Stationery .....			913 2 7
Miscellaneous Receipts .....	43	3	5	Petty Expenses (including Tea and Postage) £116 7 4			238 8 6
	£3300	12	9	Fellows' postal account .....	6	19	6
				Linnean Medal.....			123 6 10
				Balance at Bankers, 30th April, 1921 £355 8 2*			15 5 0
				Do, deposits, Fellows' postal account .....	108	8	4
				Cash in hand .....	7	10	11
							471 7 5
							£3300 12 9

\* Already allocated for printing in hand.

£ s. d.

To Balance at Bankers, 1st May, 1920:—		122	14	4
Westwood Fund .....	£	4	7	
Trail Award Fund .....		19	6	0
Crisp Award Fund .....		20	9	8
Hooker Lecture Fund .....		20	10	7
Tagart Fund .....		18	5	7
Goodenough Fund .....		42	16	11
Library Catalogue Fund .....		1	1	0
Donations:—				
Goodenough Fund .....	£15	4	0	
Tagart Fund .....		6	0	0
Annual Dinner Fund Balance .....		21	4	0
Compounders Donation Fund .....		4	0	6
Interest on Investments:—		117	1	8
Westwood Fund .....	£8	13	11	
Trail Award Fund .....		3	10	0
Crisp Award Fund .....		6	6	4
Hooker Lecture Fund .....		20	17	5
Tagart Fund .....		20	5	7
Goodenough Fund .....		3	9	0
		63	2	3
		<u>£328</u>	<u>2</u>	<u>9</u>

£ s. d.

By Trail Award to Dame Helen Gwynne-Vaughan.....				
" Purchase and Binding of Books (Tagart Fund) ...				
" Contribution to General Account from Goodenough Fund .....		4	0	0
" Purchase of £50 Victory Bonds 4%:—				
Goodenough Fund .....		39	13	0
" Balance at Bankers, 30th April, 1921:—				
Westwood Fund .....	£8	18	6	
Trail Award Fund .....		6	6	0
Crisp Award Fund .....		26	16	0
Hooker Lecture Fund .....		41	8	0
Tagart Fund .....		14	12	8
Goodenough Fund .....		17	16	11
Library Catalogue Fund .....		1	1	0
Annual Dinner Fund .....		4	0	6
Compounders Donation Fund .....		117	1	8
		238	1	3
		<u>£328</u>	<u>2</u>	<u>9</u>

*Investments on April 30th, 1921.*

*General Account.*

	£	s.	d.	
450	0	0	0	
1000	0	0	0	
1200	0	0	0	
1000	0	0	0	
1000	0	0	0	
300	0	0	0	
3200	0	0	0	
Value, 30th April, 1921.	£	s.	d.	
@ 57½		258	15	0
@ 64		640	0	0
@ 49		588	0	0
@ 57½		575	0	0
@ 69		690	0	0
@ 38		114	0	0
@ 88		2816	0	0
		<u>£5681</u>	<u>15</u>	<u>0</u>

*Separate Account: Investments on April 30th, 1921.*

£	s.	d.		£	s.	d.		
£870	9	5	Metropolitan Water Board 3 per cent. "B" Stock (Westwood Fund) ..... Ditto (Hooker Lecture Fund) .....	@ 54	125	8	4	
	638	4		5	@ 54	344	12	9
	252	18	0	@ 61	61	0	0	
	530	0	0	@ 47½	120	2	6	
	50	0	0	@ 52½	278	5	0	
£250	0	0	4 per cent. Victory Bonds.....	@ 7½	196	5	0	
	50	0		0	(Westwood Fund) .....			
	50	0		0	(Tagart Fund).....			
	100	0	0	(Hooker Lecture Fund)				
				(Woodenough Fund) ...				
					£1128	13	7	

HORACE W. MONCKTON, *Treasurer.*

We have in conjunction with the Professional Auditor, who certifies as to all details) audited the Accounts of the Society for the year ended 30th April, 1921, and found them correct. We have verified the Investments and Bank Balances.

Dated this 12th May, 1921.

W. B. KEEN, *Chartered Accountant.*

A. SMITH WOODWARD, }  
 W. T. CALMAN, }  
 G. W. E. LODER, } *Auditors*  
 A. B. RENDELE, }  
 H. N. RIDLEY, }  
 E. J. SALISBURY. }

## PRESIDENTIAL ADDRESS, 1921.

## OBSERVATIONS ON SOME EXTINCT ELASMOBRANCH FISHES.

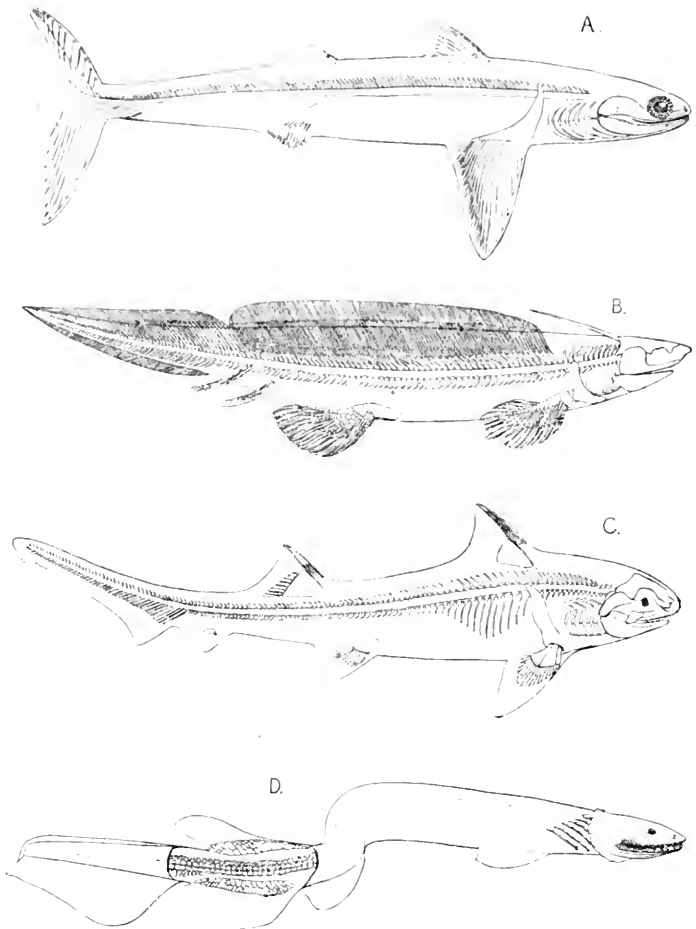
LINNEUS was unfortunate in his treatment of the sharks, rays, and chimæras, which he ultimately removed from the class of fishes, and arranged among the reptiles as part of the order Amphibia Nantes. A little later the anatomists Cuvier, Johannes Müller, and others, by their more extended researches, first pointed out the true nature and relationships of these fishes; while in more recent years the morphologist, Carl Gegenbaur, and the embryologist, Francis Maitland Balfour, finally led to our modern conceptions of the group. The time has now arrived to test their conclusions by reference to the ancestral sharks and skates, of which the fossil remains have been discovered and studied in increasing numbers during the last three decades; and as I have had the opportunity of examining most of these discoveries, I propose briefly to discuss our present knowledge of the subject. So long as most of the extinct forms were represented only by isolated teeth and spines, it was impossible to determine satisfactorily their relationships, but now that many are known by at least parts of skeletons a detailed study of them is not in vain. The teeth and spines suggested to the early observers that since their first appearance in Silurian or Devonian times the sharks, rays, and chimæras had always remained much as they are at the present day, and could be quoted as remarkable instances of persistent types. Every advance in our knowledge of better-preserved fossils has tended to show that, like all other animals, these fishes have really evolved in many directions.

## PLEUROPTERYGII.

Leaving out of consideration the earliest shark-like fishes—the Acanthodians—which developed an unique exoskeleton and appear to have left no modern descendants, it may be said that the Devonian sharks of the order Pleuropterygii nearly realise our conception of the common ancestor. In the typical genus *Cladoseclache*\*, from the Upper Devonian Waverly Shales of Ohio, U.S.A. (fig. 1A), the slender hyomandibular seems to have taken little part in the support of the jaws, which are of the primitive amphistylic type. The mouth is terminal, and the teeth, though arranged and reproduced as in the ordinary modern sharks, pass by insensible gradations of shape into the shagreen of the head. The notochord must have been persistent, and the cartilages of the arches, so far as they have been seen, are of diagrammatic

\* B. Dean, Mem. Amer. Mus. Nat. Hist. vol. ix. (1909), pt. v.; Hussakof & Bryant, Bull. Buffalo Soc. Nat. Sci. vol. xii. (1918), p. 127.

Fig. 1.



Series of Successive Types of Elasmobranch Fishes. A. *Cladoselache*, typically Devonian, with fins supported by simple parallel rods of cartilage, the paired fins merely balancers (after Dean). B. *Pleuracanthus*, typically Permian-Carboniferous, with paired fins as paddles (after Fritsch). C. *Hybodus*, typically Jurassic, with paired fins for swimming, persistent notochord, and simple vertebral arches. D. *Chlamydoselache*, now existing, exemplifying the Cretaceous and Tertiary type, with cartilages pressed between the neurals and haemals, and the supports of the fins more or less irregularly subdivided (after Garman).



simplicity. The membrane of the dorsal fin, though subdivided into two small remnants, is strengthened by simple parallel rods of cartilage, which were doubtless supported by similar rods between the muscles. The membranes of the paired fins are similarly strengthened by parallel rods, each with a corresponding support within the body-wall; but instead of being notched at the axil behind, they extend along the body and gradually taper backwards beyond the strengthened part. The paired fins are, in fact, obviously mere remnants of a once-continuous pair of folds. There is no ordinary anal fin, but Dr. Bashford Dean\* has suggested that it may be represented by the pair of horizontal fin-folds, supported within the body-wall by rods of cartilage, occurring close to the base of the caudal fin, which is highly specialised and heterocercal. The slime-canal of the lateral line, as shown by the arrangement of the shagreen along its course, must have been an open groove. Still more interesting, some of the muscles and other soft parts are often preserved in the fossils, and Dr. Dean † has identified the kidneys, showing their microscopic structure, extending remarkably far back beyond the pelvic fins. The body-cavity and the alimentary canal must therefore have extended backwards as far as the end of the tail, thus fulfilling F. M. Balfour's prediction from embryology that this condition would eventually be found in primitive vertebrates.

The identification of the kidneys is especially important, because in one specimen of *Cladoselache kepleri* in the British Museum (no. P. 9269) they are displaced by crushing behind the pelvic fins in such a manner as to look like claspers appended to the fins. They have indeed been mistaken for these organs by Prof. O. Jaekel ‡, who has published a restored sketch of the fish, which is now unfortunately being copied in text-books. We have been able to make a microscope-section of a fragment of the fossilised tissue in the specimen in question, and both Dr. Dean and I are satisfied that it is kidney, not cartilage. There is no trace of a pelvic clasper in any *Cladoselachid* we have examined (we have seen nearly all the known specimens), and the only well-preserved pelvic fins end behind in a tapering membrane.

Prof. Jaekel's restored sketch just mentioned also embodies a theoretical interpretation of the pectoral fins, which still needs more evidence before it can be established. Apart from a few parallel bars, the supports of the pectoral fin within the body-wall have not hitherto been clearly seen in the specimens of *Cladoselache* from Ohio; but in one fragment of an obviously similar shark from the Lower Carboniferous of Scotland, described by Traquair §, the row of bars supporting the pectoral fin is continued backwards

\* *Loc. cit.* (1909), p. 233.

† *Loc. cit.* (1909), p. 231, text-figs. 30, 31.

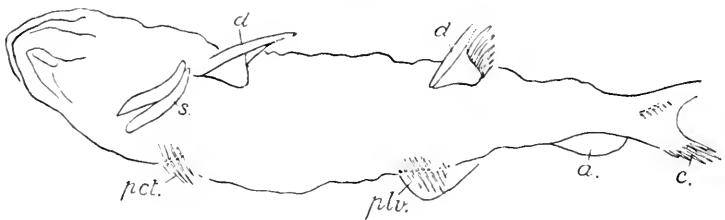
‡ Sitzungsber. k. preuss. Akad. Wiss., phys.-math. Cl. 1909, p. 715, fig. 6.

§ *Cladodus neilsoni*, R. H. Traquair, Trans. Geol. Soc. Glasgow, vol. xi. (1897), p. 41, pl. 4.

beyond the fin itself by a row of broad quadrangular cartilages. These may also have been retained within the body-wall, as a remnant of the support of a formerly extended fin-fold; or they may have begun to project outside the body-wall, as Jaekel represents them, to form the beginning of the paddle-shaped fin which we find in the next grade of sharks, the Ichthyotomi. I think that if they had already begun to enter into a movable paddle, they would have been sufficiently well calcified to be preserved in many specimens.

We have already noted that the dorsal fin of *Cladoscclache* is subdivided without any essential modification of its primitive stiffening rods of cartilage. It is interesting now to add that a closely related genus, *Ctenacanthus*, equally generalised, has a spine, of the ordinary shark-pattern, in front of each dorsal fin. Dr. Dean\* has described part of a well-preserved specimen from Ohio, and I have lately found that the nearly complete fish from the Lower Carboniferous of Scotland, named *Ctenacanthus costellatus* by Traquair†, is not a Cestraciant, as hitherto supposed, but a true Pleuropterygian. In the latter specimen (fig. 2), the simple tapering, parallel rods of cartilage strengthening the membrane are seen in both the pectoral and pelvic fins, and they are clearly supported by a corresponding series of parallel rods

Fig. 2.



Explanatory outline of the parts shown in the fossil *Ctenacanthus costellatus* from the Lower Carboniferous of Scotland, one-eighth nat. size. *a.* part of anal fin, displaced; *c.* caudal fin; *d.* dorsal fin with spine; *pct.* pectoral fin; *plv.* pelvic fin; *s.* cartilages of pectoral arch.

within the body-wall. Each dorsal fin-spine is supported by a triangular plate of cartilage between the muscles; but the membrane of each dorsal fin is strengthened by the usual simple tapering parallel rods, of which the foremost is much the largest and stoutest. There are no traces of an ordinary anal fin, but the area of shagreen-covered skin already noticed by Traquair as displaced beneath the caudal pedicle, probably represents the horizontal lateral dermal expansion which is so peculiar a feature

\* *Loc. cit.* (1909), p. 249, pl. xxxiii, text-figs. 42-45.

† *Geol. Mag.* [3] vol. i. (1884), p. 3, pl. 2.

of *Cladoseleche*. A row of broad cartilages among the obscure remains of the upper lobe, and the pointed ends of the cartilaginous rods in the lower lobe of the heterocercal caudal fin, are also suggestive of the corresponding structures in the tail of *Cladoseleche*.

The powerful heterocercal caudal fin of *Cladoseleche* and *Ctenacanthus* shows that these fishes were habitually free swimmers, not merely grovellers on the sea-bottom. The horizontally extended shape of the paired fins of the Pleuropterygii, therefore, cannot be explained as an adaptation to a life like that of the skates. The fins can indeed only be regarded as the little-altered remnants of primitive continuous folds, as already observed; and if the axial skeleton were sufficiently well calcified to be preserved in the fossils, the cartilaginous fin-supports would doubtless prove to be correlated in number with the vertebral arches.

#### ICHTHYOTOMI.

The correlation just mentioned, which is postulated by our present theory of the primitive vertebrate, is actually seen in several well-preserved skeletons of the Carboniferous and Permian sharks of the order Ichthyotomi\*. These were for long the most primitive Elasmobranchs known, but they exhibit an advance on the Pleuropterygii and approach the ordinary modern Selachii in the structure of the paired fins. The pectoral is a unibasal "crossopterygian" fin, which may easily have been derived, by concentration of the cartilaginous supports, from the polybasal Devonian type of fin, and I still think it may have passed into the dibasal or tribasal fin which is specially characteristic of the Selachians of later periods. The pelvic fin of the male bears the typical Selachian clasper. The only known Ichthyotomi (e. g., *Pleuracanthus*, fig. 1 B) are elongated fishes with a diphyccercal tail, evidently bottom-dwellers, and the paddle-shaped pectoral fin was probably used as in the Dipnoan *Ceratodus*.

Like the Pleuropterygii, all the Ichthyotomi hitherto discovered have a persistent notochord without even the beginning of vertebral bodies. Hasse's determination† of ring-vertebræ in two specimens in the British Museum is based on mistaken observations: in the one case (no. 35015) the supposed vertebræ are the segments of the axis of a displaced pelvic fin, in the other case (no. 19665) the structures appear to be the bases of neural arches.

During recent years little has been added to our knowledge of the Ichthyotomi. I would, however, remark that a new chondrocranium from the Upper Devonian of Germany which may belong to a primitive shark‡, seems to show symmetrical clefts in its

\* See especially A. Fritsch, Fauna der Gaskohle Permform. Böhmens, vol. iii, pt. i. (1890).

† C. Hasse, Neues Jahrb. für Min. etc. 1883, vol. ii. p. 65.

‡ *Jagorina pandora*, O. Jaekel, Palæontol. Zeitschr. vol. iii. (1921), p. 217, text-figs. 1-3.

occipital region like those already noticed by Cope and others in the Pleuracanth skull. There is thus confirmation of the view that cranial cartilage sometimes became differentiated into separate parts before it was covered with membrane-bones.

#### BRADYODONTI.

Among the earliest Elasmobranch fishes, there were many in which the teeth did not fall away from the edge of the mouth when they were discarded, as in all modern sharks and skates, but became fused with their successors into antero-posterior rows which were retained in some way outside or beneath the teeth actually in use. These rows, when completely preserved, exhibit all the successive teeth acquired during the lifetime of the individuals to which they belonged: and from them we learn that many of the Palæozoic sharks (e. g., *Campodus* and *Helicoprion*) had successional teeth as numerous and as rapidly-growing as in the familiar existing forms. Some rows, however, such as those of *Janassa* and the Cochliodonts, prove that there were also other sharks or skates in which the successional teeth were very few—not more than 7 or 8 during the whole lifetime and each one much larger than its predecessor. We know very little of these fishes beyond their teeth, but they seem to form a natural group intermediate between the primitive Elasmobranchs and the Chimæroids or Holocephali. From the slowness of their tooth-changes they may be named Bradyodonti.

The typical family of the Bradyodonts is that of the Petalodontidæ, represented by several Carboniferous genera but best known by the Lower Permian *Janassa*\*. This is a skate-shaped fish, with paired fins which seem to have been on the ordinary Selachian plan. The teeth are arranged in 5 or 7 antero-posterior series, forming a powerful grinding pavement, chiefly on the symphysis, where the two rami at least of the lower jaw are firmly fused together. Only the latest row of teeth is in use at any time, the predecessors in the several antero-posterior series being piled up beneath the functional teeth to act as supports (fig. 3). From these piles we learn that during the greater part of its lifetime each individual *Janassa* had only 7 or 8 successional teeth. In the Lower Carboniferous *Climacodus*†, the teeth from early youth to old age are spread in antero-posterior series as a pavement along a continually elongating symphysis of the jaw, and there are shown to be only 5 or 6 teeth in succession during the greater part of the individual life. Many of these teeth exhibit a conspicuous patch of much-hardened tubular dentine, very suggestive of the tritons on the dental plates of the Chimæroids.

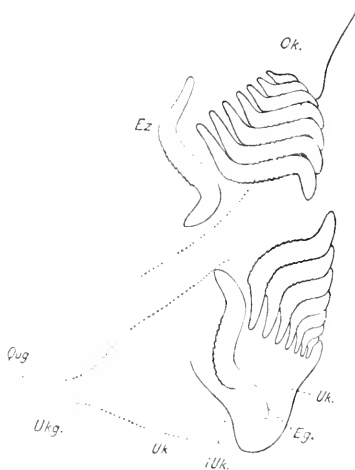
The Carboniferous Psammodontidæ are known solely by the teeth of *Psammodus*, which are flattened grinders arranged in one

\* O. Jaekel, Zeitschr. deutsch. geol. Gesell. vol. li. (1899), p. 259, pls. 14, 15.

† A. S. Woodward, Quart. Journ. Geol. Soc. vol. lxxv. (1920), p. 1, pl. 1.

paired series along the symphysis of the jaw. Each of these teeth is so much narrower in front than behind, that there must have been very few in succession during the individual lifetime. The dentine is coarsely tubular and uniform throughout the crown of the tooth. In very young individuals the teeth of the right and left sides are proved to differ a little in width; and in adult individuals all the teeth of one side, so far as known both in Europe and America, are very much wider than those of

Fig. 3.



Diagrammatic transverse section of jaws with teeth of *Janassa bituminosa* from the Lower Permian of Thuringia, about nat. size (after Jaekel). Six discarded successional teeth are seen resting beneath the tooth which is in use both in the upper (*Ok.*) and in the lower (*Uk.*) jaw; while another successional tooth, above (*Ez.*) and below (*Eg.*), is shown ready to come into place in due time. *Qug.* and *Ukg.* mark the articular ends of the jaws.

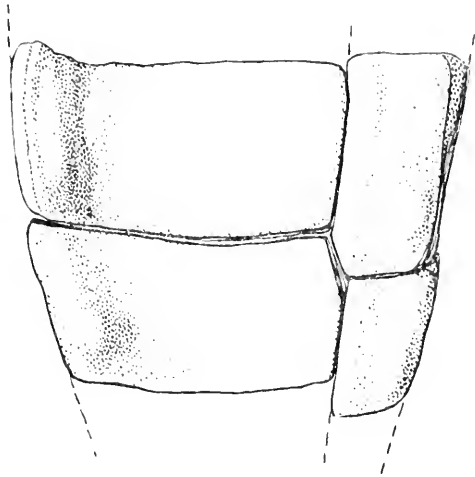
the other side. The dentition must therefore have exhibited the unusual asymmetry represented in fig. 4, and this asymmetry would be reversed in the two jaws.

The Upper Devonian and Carboniferous Copodontidæ, which are also known only by their teeth, seem to approach the Chimæroids more closely than the Psammodontidæ. In them the teeth are bilaterally symmetrical, arranged along the symphysis of the jaw in a single antero-posterior series, and embedded in a greater or less extended plate of highly vascular and softer dentine. The succession of these teeth in the typical Carboniferous genus *Copodus* is very difficult to understand; and in the

Upper Devonian genus *Aconiodus*\*, two of them, of very different shape and size, are seen embedded in a bilaterally-symmetrical pentagonal plate of the soft dentine already mentioned. The discovery of skeletons of the Copodontidæ will prove of great interest.

In the Carboniferous *Cochliodontidæ* the grinding or crushing teeth have the same structure as those of the other *Bradyodonts*, but they are arranged on the rami of the jaws as in the existing *Cestracion*. As first pointed out by Owen †, most of the antero-

Fig. 4.



Diagrammatic oral view of unsymmetrical paired series of teeth of *Psammodus rugosus*, from the Lower Carboniferous of Armagh, Ireland, about one-half nat. size.

posterior series of the teeth differ from those of *Cestracion* in being fused into continuous plates, each curving into a little scroll at the anterior or outer border. The components of these plates, however, have now been seen in many specimens which are marked by partially obliterated sutures, and it is clear that they were never more than 6 or 7 in number—thus very different from the long and rapid succession of teeth in the *Cestracionidæ*. The *Cochliodontidæ* were indeed *Bradyodonts*. Nearly all the genera are known only by teeth, but the generalised *Helodus* is represented in the Ward Collection in the British Museum by several portions of skeletons. In these fossils there is no trace of the vertebral axis, which must have been notochordal.

\* *Aconiodus clarkei*, Hussakof & Bryant, Bull. Buffalo Soc. Nat. Sci. vol. xii. (1918), p. 151, pl. 55, fig. 3.

† *Odontography* (1840), p. 62.

The paired fins seem to resemble those of a modern Selachian, and the anterior dorsal fin is provided with a spine. The posterior dorsal fin seems to have been without a spine, as in the Chimæroids. In the highly specialised *Cochliodont Deltotyphchius*\* there are tuberculated spiny plates on the head, suggestive of some on the head of the earliest known typical Chimæroid *Myriacanthus*, which occurs in the English Lower Lias.

It may be added that the resemblance of the Cochliodont dentition to that of the Chimæroids has already been observed both by Owen † and Egerton ‡; and some of the Cochliodonts and Chimæroids have been grouped together by Jaekel § under the name of Trachyacanthidæ. The so-called teeth of Chimæroids from Devonian formations (e. g., *Ptychodus*) probably belong to fishes of a very distinct group.

### SELACHII.

Traquair's discovery of *Tristychius*|| in the Calciferous Sandstone of Eskdale, Dumfriesshire, shows that there were already ordinary sharks, with dibasal or tribasal pectoral fins and a normal tooth-succession, at the beginning of the Carboniferous period. Until Lower Jurassic times, all seem to have retained the persistent notochord; and the few well-preserved neural arches which have been seen are long and well separated, without any intercalary cartilages. Since then most of the true Selachii, as I term them, have acquired vertebral centra, and a consolidation of the neural arches with intercalated cartilages; most of them (including even the most primitive, like *Chlamydoselache*, fig. 1 D) also show various irregular fusions and subdivisions of the cartilage-supports of the fins. They have also evolved into more numerous families, and several parts of their skeleton have become specialised in different ways.

The Hybodonts (fig. 1 C), which for the most part exhibit the primitive notochordal condition until the Lower Cretaceous period,\* are especially interesting because, while their dentition and their general appearance resemble those of the existing Cestraciontidæ, their skull is very different and more closely agrees with that of the Notidanidæ¶. They are indeed a generalised group from which several later families appear to have arisen, and they are the dominant sharks of the Jurassic and early Cretaceous periods. In Upper Jurassic rocks, however, we begin to find good evidence of several modern families of both

\* A. S. Woodward, Proc. Geol. Soc. vol. lxxi. (1915), p. lxxviii, text-fig. 2.

† Odontography (1840), p. 65.

‡ Quart. Journ. Geol. Soc. vol. xxviii. (1872), p. 236.

§ Sitzungsber. Ges. Naturf. Freunde, Berlin, 1890, p. 130; also *ibid.* 1891, p. 127.

|| Geol. Mag. [3] vol. v. (1888), p. 83.

¶ A. S. Woodward, Foss. Fishes Weald. & Purb. Form. (Mon. Palæont. Soc. 1916), p. 6, text-fig. 3.

sharks and skates, and some of the fossils are essentially identical with forms living at the present day. The Cestraciontidae, Notidanidae, Scylliidae, Squatinidae, and Rhinobatidae, of which fine skeletons are known from the Lithographic Stone of Germany, were certainly already differentiated in Upper Jurassic times. The Spinacidae were also nearly in existence, one fish having been found which is only distinguished from the Spinacidae by retaining a small anal fin\*.

The typically modern sharks of the family Lamnidae did not appear until the Cretaceous period, and were not abundant until the time when the Chalk formation was deposited. The Carchariidae arose even later, and their remains are not known from rocks earlier than the Tertiary. The great skates also began to be differentiated towards the end of the Cretaceous period, and by the beginning of the Tertiary they were almost the same as in existing seas, only with a different geographical distribution.

Of progressive specialisations of certain skeletal structures which can be followed among the fossils, perhaps the most interesting is the evolution of the rostrum in the saw-fishes or Pristidae. We have already seen that Rhinobatidae occur in the Upper Jurassic. *Rhinobatus*-like fishes in the Upper Cretaceous of the Lebanon, begin to have the rostrum elongated and strengthened, and fringed with a row of sharp enamelled teeth loosely fixed along each lateral edge †. *Onchopristis* ‡, from the Upper Cretaceous of Egypt, and *Onchosaurus* §, from many Cretaceous formations, have these rostral teeth larger and barbed at the apex, with a tendency to reduction of the enamel. *Propristis* ||, from the Lower Eocene of Africa, has a still longer stiffened rostrum, with the lateral teeth peg-shaped, loosely fixed in very shallow sockets, and with scarcely any trace of enamel. The modern *Pristis*, which ranges from the Middle Eocene onwards, has the peg-shaped rostral teeth sunk in deep sockets of cartilage. In the early stages of the development of the rostral weapon there was thus much variety; in the latest stage there is only one form.

This tolerably complete history of the Pristid rostrum, which has only lately been discovered, is an illustration of the help afforded by the fossilised extinct Elasmobranchs in understanding the isolated survivors of the Subclass at the present day. Nearly every addition to our knowledge of the fossils during recent years, indeed, has helped to fill gaps in the series; and researches

\* *Protospinax annectens*, A. S. Woodward, Proc. Zool. Soc. 1918 (1919), p. 232, pl. 1. figs. 2, 3.

† *Sclerorhynchus atavus*, A. S. Woodward, Catal. Foss. Fishes Brit. Mus. pt. i. (1889), p. 76, pl. 3, fig. 1, and Proc. Zool. Soc. 1889, p. 449. See also O. P. Hay, Bull. Amer. Mus. Nat. Hist. vol. xix. (1903), p. 398.

‡ E. Stromer, Abhandl. k. bay. Akad. Wiss., math.-phys. Cl. vol. xxviii. Abh. 8 (1917), p. 12, pl. 1.

§ E. Stromer, *loc. cit.* (1917), p. 11.

|| E. Fraas, Neues Jahrb. für Min., etc., 1907, vol. i. p. 1, pl. 1.



like those of Regan \* on the general morphology, and of Ride-wood † on the axial skeleton of existing groups, are enhanced in value by the contributions made by palæontology. We have seen that the earliest known Elasmobranchs almost realise the ancestral vertebrate type as now conceived. Very soon the remnants of lateral fin-folds, which must have acted merely as two pairs of balancers in these fishes, concentrated into paddles, and these again passed into stout-based fins adapted for swimming. After this advance, the upper jaw-cartilages, which had already been supported by contact with the postorbital region of the skull, gradually assumed a firmer connection with its base in the Bradyodonts which eventually became Chimæroids, while they lost their direct support in nearly all the modern sharks and skates which depend on the hyomandibular and a ligament for jaw-suspension. After the differentiation of the jaws, vertebral centra began to appear, and finally there were additional growths and various fusions of cartilages which led to the diversity in the Elasmobranch skeleton observed to-day. Fossils are gradually adding to our knowledge of the successive stages through which this ultimate diversity arose, and we may hope soon to be able to trace most groups of sharks and skates backwards to their generalised common ancestors.

Mr. PERCY THOMPSON then moved:—"That the President be thanked for his excellent address, and that he be requested to allow it to be printed and circulated amongst the Fellows," which, after being seconded by Mr. J. C. SHENSTONE, was put and carried by acclamation.

The President having acknowledged the Vote of Thanks, proceeded to address Dr. DUKINFIELD HENRY SCOTT, F.R.S., reciting his services to Botany and handing to him the Linnean Gold Medal. He said:—

Dr. SCOTT,—

The Council of the Linnean Society desires to express its appreciation of your numerous and valuable contributions to botanical science by awarding to you the Linnean Medal, the highest distinction in its power to bestow. Since your first paper on the development of articulated laticiferous vessels, written 40 years ago, you have continued to devote yourself to structural botany with unflagging zeal, and your published memoirs are models both for the exposition of new facts and for the concise statement of morphological conclusions. Your early researches soon brought you into association with the late Prof. W. C. Williamson, whose pioneer work on the structure of the petrified plants found in certain coal-seams was attracting wide

\* Proc. Zool. Soc. 1906, pp. 722-758, with figs.

† Phil. Trans. vol. 210B (1921), pp. 311-407.

attention among botanists; and from 1893 onwards you have taken a foremost place in advancing our knowledge of the later Palæozoic flora. You began by co-operating with Prof. Williamson in three important memoirs on the Calamites and on *Lyginodendron*, published in the 'Philosophical Transactions,' for 1895; and after his death in that year you continued alone to add other memoirs to the same series. In your account of the Sphenophyllales, you described *Sphenophyllum fertile*, a new form of fructification, and also *Cheirostrobus*, a remarkable cone to be regarded as the type of a new family. Your memoir on *Lepidocarpon* afforded the final proof that some Lycopodiaceous plants in the coal-period developed seed-like bodies, and you made another valuable contribution to our knowledge of lycopod fructification by your description of *Spencerites*. Among the Pteridosperms, you were the first to recognise a species of *Medullosa* from British Carboniferous rocks, and your descriptions both of that genus and *Heterangium*, and of the new genus *Sutcliffia*, made fundamental advances. You also joined Prof. F. W. Oliver in an exhaustive study of *Lagenostoma* which established its reference to *Lyginodendron*. Among your numerous contributions to our knowledge of primitive ferns, your discovery of *Botrichioxylon*, with its secondary wood, is memorable; and you were the first to find germinating spores in *Stauropteris*. In other memoirs you have described the stem-structure of the Cycadofilices and Cordaitales, particularly *Calamopitys*, *Mesoxylon*, and *Pitys*. Your researches, indeed, have thrown light on the phylogeny and relationships of almost every group of Carboniferous plants, and your joint work with Prof. E. C. Jeffery on *Stereopteris*, *Archæopitys*, and other plants from the Waverly Shales of Kentucky, deals with some of their immediate ancestors.

While actively engaged in research yourself, you have also stimulated others to follow your example. As Assistant Professor first at University College, then at the Royal College of Science, and afterwards as Honorary Keeper of the Jodrell Laboratory at Kew, you were able to exert personal influence. In 1884 you and Prof. Bower published a useful translation of de Bary's "Comparative Anatomy of the Vegetative Organs of the Phanerogams and Ferns"; in 1888 you helped to revise Huxley and Martin's well-known "Practical Biology"; while in 1894 and 1896 you reached a still wider circle of students by the two parts of your admirable "Introduction to Structural Botany." In 1900 you published the first edition of your "Studies in Fossil Botany," which has become a classic and is now being issued in a third edition. In 1908 you revised the English translation of Solereder's "Systematic Anatomy of the Dicotyledons," and in 1911 you wrote a little book which has fascinated many of us, "The Evolution of Plants." Since 1893 you have also promoted botanical science by editing the 'Annals of Botany.'

Finally, the Linnean Society remembers with gratitude your long and devoted service as member of Council, as Secretary, and

as President. I know it eagerly endorses the action of the Council in offering you this mark of its admiration and esteem; and as one who has long enjoyed both your friendship and your scientific comradeship, it gives me the greatest pleasure to be the means of conveying the Medal to you.

The recipient made a suitable reply.

The General Secretary having laid on the table certain obituary notices, the proceedings terminated.

### OBITUARY NOTICES.

For several years past our Meetings have missed the presence of the veteran botanist, JOHN GILBERT BAKER, who, in the memory of many of us, was at one time an assiduous frequenter of these rooms, and an indefatigable contributor to our publications.

Born at Guisborough, Yorkshire, on the 13th January, 1834, he was only eight months old when his parents, John Baker and his wife Mary Gilbert, removed to Thirsk, where our late Fellow's early boyhood was passed. In 1843 he was placed at the Friends' School at Ackworth, and there began to show his bent by making a collection of local plants. Three years later he was transferred to the Friends' School at Bootham, York, already known for its vigorous development in natural history study. In his fourteenth year Baker was awarded the annual prize for his collection of botanical specimens, and became curator of the school herbarium.

In the autumn of 1847 Baker quitted school to help his father in business, and for the next eighteen years he was busy in Thirsk, but without abandoning his love for plants. In 1849 he contributed a paragraph to the 'Phytologist,' iii. p. 738, on the occurrence of *Carex Persoonii* in the north-east of Yorkshire. He collaborated with John Nowell in a supplement to Baines's 'Flora of Yorkshire,' which came out in 1854, and the next year saw the issue of a pamphlet on British plants classified according to their geognostic relations. In 1859 he became Curator and Secretary of the Thirsk Botanical Exchange, which has preserved its existence and now is known as the Botanical Exchange Club and Society, which came south about the same time as our late Fellow. Amongst Baker's friends were Daniel Oliver, then known as 'tertius,' a young Northumbrian botanist, who, four years his senior, had in 1858 been installed by Sir William Hooker as Librarian at the Royal Gardens, Kew.

The year 1863 witnessed the publication of Baker's first important work, 'North Yorkshire,' a volume of nearly 400 pages,

with maps, and an expansion of the views put on record in the 1855 tract; it was printed at Thirsk, where the bulk of it was stored on the author's business premises, when a fire in 1864, due to the carelessness of a passer-by, destroyed the house and contents, including his own herbarium and botanical library. He had in August 1860 married Hannah Unthank, and their first-born, Edmund Gilbert, an infant born on the 9th February, 1864, was carried out to safety.

The sympathy of his large circle of botanical and other friends made good, in part, his botanical losses, though the stock of his 'North Yorkshire' could not be replaced. But Baker's future life was determined by this accident; in the same year he had published in the 'Naturalist' for 1864 a revision of the British Roses, which even drew attention on the part of foreign botanists; in 1865 he printed a monograph of British Mints in the 'Journal of Botany.' In 1862 Mrs. Borrer had given to Kew the whole of her late husband's herbarium, and the incorporation of a certain portion was needed for the Director's immediate work. Sir W. Hooker had noted the excellence of Baker's work on Roses, and also his increasing inclination to the study of ferns in the Club reports; the invitation to this was sent, but in August 1865 Sir W. Hooker died at the age of 80. Among the unpublished material left by the veteran was the unfinished MS. of the 'Synopsis Filicum,' the preface, and proofs of the first three sheets. The new Director's hands were full of executive work, and the completion of the 'Synopsis' could only be done at Kew. This involved the creation of a new post, which was arranged thus. In 1861 Oliver, already mentioned as the Librarian at Kew, had been allowed to augment his stipend by accepting the Chair of Botany at University College, vacated by Dr. John Lindley due to failing health, and in 1864 by the keeper of the Herbarium, A. A. Black, resigning that post to seek health in a warmer climate. The Keepership and Librarianship were then amalgamated, and the Assistant Directorship lapsed when the younger Hooker succeeded his father. The post of First Assistant was confirmed on the 1st April, 1866, Baker having taken up his duties in anticipation on the 1st of January in that year. On the 5th of April, five days after the official confirmation of his new appointment, he was elected a Fellow of our Society.

Soon after he was thus permanently settled in his new appointment, he was permitted to follow the example of his chief and add to his income outside. Thus from 1869 to 1881 he was lecturer on botany at the London Hospital Medical School; in 1874 one of the lecturers to young gardeners at Kew, which he retained till 1904, five years after he had retired from office; also lecturer at the Chelsea Physic Garden from 1882 to 1896.

When Prof. D. Oliver retired at sixty years of age, Baker was promoted to the vacant office on 1st June, 1890, which he held until he himself reached the age of 65 in 1899. On leaving office

he still utilized the herbarium and garden, and though gradually his physical strength failed, he retained possession of his mental powers to the end. He died at Kew on 16th August, 1926, in his 89th year, and was buried on the following Thursday, 19th August, in the Friends' Burial Ground, London Road, Isleworth.

Baker's work after his arrival at Kew was prodigious, largely due to the fact that he concentrated his attention upon families which did not need the help of the microscope to describe them. Mr. George Bentham more than once said to the present writer that "Baker never soaks a flower." Yet Baker's astounding output was accomplished in a quiet manner, entirely devoid of fuss or the visible hurry plainly shown by his chief (Proc. Linn. Soc. 1916-17, p. 56). No doubt the secret lay in the large amount of time spent in work at home after official hours; he really lived for systematic botany.

The 'Synopsis Filicum' has already been mentioned; it came out in 1868, reaching a second edition in 1874, and he was at once looked upon as a leading author upon vascular cryptogams, leading to his being engaged on the ferns for the great Brazilian Flora (1870). But even before the 'Synopsis' appeared, Baker had printed a list of cultivated Selaginellas in the 'Gardeners' Chronicle' for 1867, a medium which brought out no inconsiderable part of his pioneer work for cultivated plants. A revision of *Narcissus* came out in the 'Journal of Botany' in 1870, which was reshaped in 1875 as part of Burbidge's 'Narcissus' volume. Baker was also busy for Oliver's 'Flora of Tropical Africa,' elaborating for the first volume in 1868 the Ampelideæ, Sapindaceæ, and Connaraceæ, and in the second (1871) the whole of the Papilionaceæ, 257 pages, nearly one-half of that volume, and in the third (1877) the small families of Myrsineæ and Sapotaceæ. In the same year as the 'Synopsis' appeared Baker was responsible for the official catalogue of the ferns cultivated at Kew. Mr. Wilson Saunders, of Reigate, was printing his 'Refugium botanicum,' plates and descriptions of interesting but not showy plants, and Baker contributed to the five volumes from 1869 to 1873; and from 1870 to 1875 he helped in editing the 'Journal of Botany,' in which so many of his shorter essays appeared. He gave an account of *Yuccas* in the 'Gardeners' Chronicle' for 1870, and in the same autumn he had his "Geographical Distribution of Ferns" printed in the Transactions of our Society, and in our Journal for the next year he produced his "Monograph of British Roses."

Baker's publications from this period onwards became so frequent and many that the writer must summarize them after alluding to the volumes he wrote. 'Elementary Lessons in Botanical Geography' (1875); the 'Flora of Mauritius and the Seychelles' (1877); *Compositæ* (1873-1884), *Connaraceæ*, and *Ampelideæ* (both in 1871) for Martius's 'Flora Brasiliensis'; 'A Flora of the English Lake District' (1885); 'Handbook of the Fern Allies' (1887); 'Handbook of the Bromeliaceæ' (1889); 'A summary of the new Ferns . . . since 1874' (Oxford, 1892);

'Handbook of the Iridaceæ' (1892); and with G. R. Tate, 'A New Flora of Northumberland and Durham' (Newcastle-on-Tyne, 1868). As to Colonial floras, he continued to co-operate on them; to the 'Flora of Tropical Africa,' 'Flora Capensis,' and 'Flora of British India' (Leguminosæ, vol. ii, pp. 56-306) he contributed valuable portions. To our own Journal, besides the "Monograph of British Roses" spoken of above, he sent revisions of Liliaceæ, Scilleæ, and Chlorogaleæ, Tulipeæ, Asparagaceæ, "Systema Iridearum" (in our 16th volume), Hypoxidaceæ, Colechicaceæ, Alcinææ, and Yuccoideæ, the tuber-bearing Solanums, and many papers of new species from Madagascar. In the 'Journal of Botany' we may note "Dactyloid Saxifrages" (1870), a Monograph of *Xiphion* (1871), Cape Species of *Athericum* (1872), *Acckmea* (1879), *Isœtes* (1880), *Pitcairnia* (1881), *Selaginella* (1884), and *Tillandsiæ* (1887-88). Amongst his many contributions to the 'Gardeners' Chronicle' were these:—*Yuccas* (1870); all known Lilies (1871); *Crocus* (1873); *Iris* (1876); *Agave* (1877); *Aquilegia* (1878); Hardy Sempervivums (1879); *Crinum* (1881); *Cyclamen* (1883); Cultivated Asters (1884); New Garden Plants, a running series from 1888 to 1892.

The "North Yorkshire" was reprinted in the Transactions of the Yorkshire Naturalists' Union, re-issued in 1906.

The last contribution in our Journal is "A Revised Classification of Roses, 1905," printed in vol. xxxvii. pp. 70-79, in some degree a forerunner of his descriptions in Miss Willmott's volumes "The genus *Rosa*," 1910-14.

Our Linnean Medal was presented to John Gilbert Baker in 1899; he was elected F.R.S. in 1878; the Victoria Medal of Honour was awarded by the Royal Horticultural Society in 1897, who appointed him an Honorary Life Fellow in 1888; lastly, in 1919 the University of Leeds conferred upon him the Honorary Degree of D.Sc.

His character is admirably summed up by Sir David Prain, whose words we are permitted to add.

"The sense of proportion which rendered Baker so distinguished as a systematic writer made him equally effective as a teacher. . . His style was lucid and concise, while he possessed the happy gift of ability to emphasize the salient features of his subject without neglecting its details. Baker's published works ensure the perpetuation of his memory as the last of a singularly gifted circle of systematic botanists. While any of them survive, those who worked with or were taught by Baker will cherish the recollection of one of the kindest and best of men." [B. D. J.]

FRANCIS MAULE CAMPBELL, who was born at Edmonton, Middlesex, in August 1843, and baptised on the 1st of September in that year, died in his sleep at Nutfield, Surrey, on 31st December, 1920. He was but little known to most of our Fellows since his retirement to Wales and his marriage in 1902, but before that he

was frequent in his attendance at our meetings, and occasionally exhibited specimens of Arachnida, which he specially studied. In our own publications are to be found papers on *Tegevaria*, the House-spider—its cocoon, glands in its maxillæ, parthenogenesis, and the pairing of the species; stridulating organs in *Steatoda* and *Linyphia*; on the flight of Dragonflies and the Humming-bird Hawk-moth; these extended from 1880 to 1883. Upon his election on the 19th December, 1878, he was living at Rose Hill, Hoddesdon, and in February 1886 was chosen as President of the Herts Natural History Society, serving the customary two years, and at the successive Anniversary Meetings in 1887 and 1888 delivering an address, the first being on 'The Means of Protection possessed by Plants,' suggested by the recent issue of R. A. Prior's 'Flora of Hertfordshire,' and the second on 'Structural Variations in the Eyes of Animals in reference to their Function'—both printed in the fifth volume of that Society's Transactions. Other papers written by him on 'Instinct,' 'Habits and Economy of our Social Wasps,' 'The Russian Fly,' and 'A White Stoat at Hoddesdon,' from 1886 to 1892, are also in the Transactions of the Herts Society.

In 1902 he married a Welsh lady and removed to Brynllwydwyd, near Machynlleth, in Montgomeryshire, where he remained till 1919, when, having become a widower, he removed to South Nutfield, Surrey, and after some months he married again, passing away, as previously stated, on the last day of 1920. He was also a Fellow of the Zoological, Entomological, and Royal Microscopical Societies. [B. D. J.]

FREDERICK MOORE CLEMENTS was born in England, but being of a roving disposition, he travelled in Central Africa, there meeting Mr. F. O. Selous, and finally settled at Sydney, New South Wales. He was successful in pharmacy and had a good knowledge of medicinal plants; he cultivated many of them in a large and beautiful garden a short distance outside Sydney, where also he had an aviary containing several hundreds of native and foreign birds. He gave liberally to patriotic objects—£1000 on "Australia Day" and £500 on "Belgium Day." His valuable library was bequeathed in great part to the Linnean Society of New South Wales. In his will he directed that many charities in England should benefit, especially the parish of Clun, in Shropshire, where the poor were to receive certain gifts every Christmas. He was elected Fellow of our Society on the 1st March, 1917, and died at his house, "Brahea" at Stanmore, on the outskirts of Sydney, on the 17th August, 1920, and was buried two days later at the Waverley Cemetery.

About two years ago he printed and distributed a little pamphlet, 'Some Faces and Places of Clem,' a characteristic product of the man; it contains a catalogue of the plants in his garden, amounting to nearly 800 names. [B. D. J.]

The death of HERBERT HENRY CORBETT, who died at Doncaster on the 5th of January last, had this additional element of pathos in that, elected last year to the Presidency of the Yorkshire Naturalists' Union, it was too recent for his assumption of its functions before his death.

He was born at "Broxups," the house near Besses o' th' Barn, between Bury and Manchester; when five years of age the family removed to Cheadle Hulme. His education was received at Dr. Keyworth's school at Alderley Edge, and later at Owens College, Manchester. For a short time he was in his father's office in Manchester, but the profession of an architect and surveyor did not satisfy him, and he returned to Owens College to study medicine. After passing his examination he deputed for various medical men at Bolton, Whaley Bridge, and Cheadle, settling finally at Doncaster in 1888, succeeding to the practice of Dr. Wadsworth. Later he became a homeopathist, probably through the influence of the Capper family in Liverpool; he married Jessie Capper in 1892, the daughter of a distinguished entomologist, and the union was a congenial and happy one. Their home became a meeting-place for naturalists and a centre for new activity in the Doncaster Scientific Society, with increased membership and a systematic exploration of the local flora and fauna; he filled the office of Secretary and then President for several years, and it was largely due to the influence of our late Fellow that the Municipal Museum was established, which, from modest beginnings, grew to the purchase of a suitable building for display and future extension. As the first Curator he had the task of arranging the exhibits, and during the absence on service of the present Curator, he reassumed his old functions. His local collection of Coleoptera is housed in the Museum.

On the outbreak of the great war, his only son Vincent volunteered for service, was wounded and spent some months at home recovering; he rejoined, but in October 1918, shortly before the Armistice, he was killed in action. This, added to the loss of his wife, six months earlier, made an indelible mark, and the subject of our remarks thereafter devoted his life to his three daughters, who survive him. On the 5th March, 1919, he was elected Fellow of the Entomological Society, and the next day Fellow of the Linnean Society, being formally admitted to the latter on the 5th June following, the last occasion when the present writer saw his friend of nearly forty years' standing. At the annual meeting of the Yorkshire Naturalists' Union at Bradford, 9th December, 1920, he was elected President for the ensuing year, and accepted the position with great pleasure, which gave great satisfaction to the members of the Union. At the moment of election he was staying at Broadstairs, recovering from a severe operation, returned home, seemingly much the better for his stay in Kent, and expressed himself feeling almost as well as ever in his life. On the 2nd January, 1921, however, the old



trouble made itself felt again, with a second operation, from which he failed to recover, and died, as mentioned previously, five days after becoming the President of the Yorkshire Naturalists' Union, and was buried in Doncaster Cemetery on the 8th of January last.

From early life he had been devoted to Lepidoptera, especially the smaller species, and his first paper came out in 'The Entomologist' for 1876, when the author was 19; and during his subsequent career his pen was busy in recording local observations. Interwoven with an intimate and sympathetic account of Mr. Corbett's life, will be found an ample statement of the entomological labours of our late Fellow, by Mr. E. G. Barford, in 'The Naturalist' for April last (pp. 145-149), with a portrait.

[B. D. J.]

JAMES RAMSAY DRUMMOND, B.A. (Oxon), was born at sea, off the coast of Madras, on the 25th May, 1851. Having been educated at Edinburgh, Glasgow, and Oxford, he joined the Indian Civil Service in 1874. He served in the Punjab as Assistant Commissioner, District Judge, and Deputy Commissioner until 1905, when he retired. Before leaving India he acted for a short time for the Curator of the Botanic Garden at Calcutta, who was then absent on leave. After his return to England he lived first at Kew and then at North Acton, where he died rather unexpectedly on April 11th of the present year. He was cremated at Golders Green, whence the ashes were taken to Scotland.

J. R. Drummond was a nephew of the two great plant collectors, James and Thomas Drummond, who contributed so largely to our knowledge of the floras of West Australia and North-west America respectively, and shared with them in the common heritage of love of plants and enthusiasm for botany. He himself collected largely in the Western Punjab, whose flora he knew intimately, and only to a lesser extent in the neighbourhood of Dalhousie and Simla, and in the Upper Gangetic plain, besides employing native collectors in various parts of the Western Himalaya. He intended to write a Flora of the Punjab, but, partly owing to enfeebled health, he was unable to carry out the plan on which he had set his heart. He had an unusually discriminative eye and a remarkable memory which aided him very much in any of the many problems he set himself to work out. Unfortunately only few of them matured into publication. But, whether he made personal use of those gifts or not, he was always ready to place them, as well as his linguistic knowledge and general versatility, unstintedly at the disposal of others. He was equally liberal in the distribution of his collections, which were intended for the great botanical herbaria at home and abroad, and of which he actually distributed the first sets before the war.

[O. STAFF.]

Capt. HAROLD STUART FERGUSON, M.B.E., who died on the 5th of January last in his seventieth year, was the son of a well-known London physician of the early Victorian days. Educated at Eton, and for a short time at Wimbledon, he passed into Woolwich Academy, and in due course obtained a commission in the Royal Artillery. After four or five years in the Service, he resigned his commission and proceeded to India to take up coffee-planting. In 1880 he was offered and accepted the post of English tutor to the three Princes of Travancore, and when they no longer required his tutelage he was appointed second in command of the Nair Brigade of native troops maintained by the Maharajah of Travancore. A few years later, while at home on leave, he married Isabel Julia, daughter of Col. Hamilton Maxwell of the Indian Staff Corps, and niece of Lady Roberts. Returning to India, he held various appointments under the Travancore Government, including that of Director of the Public Museums and Government Gardens at Trevandrum. There his great love for wild creatures showed itself in the care bestowed on the condition of the birds and animals kept in the Gardens. At the same time his collectors continually brought in rare specimens of birds, animals, and plants. Retiring from India in 1904, he settled at Ascot and became one of the private secretaries of Lord Roberts, V.C., but on the death of that distinguished soldier he moved to London and took up war-work. While his three sons were fighting for their country, he was engaged daily at the Headquarters of the London Rifle Brigade till the disease, which eventually proved fatal to him, obliged him to stop work.

Capt. Ferguson always took a great interest in the birds and animals of the part of India where he was stationed, and in 1902 he published in the 'Journal of the Bombay Natural History Society' an account of the birds of Travancore. On 4th June, 1891, he was elected a Fellow of the Linnean Society. On his retirement from India he became a constant visitor to the Zoological Gardens at Regent's Park, and before he died he was nominated a Member of the Council of that Society.

Before he went to India he played cricket for the M.C.C., I Zingari, and Eton Ramblers, and was a member of the M.C.C., Surrey County Club, and National Sporting Club. He obtained his International cap as an Association football player, and was selected to represent Scotland against England at Rugby football, but could not play as he was sailing for India.

His long jump of 21 ft. 2½ in. held the amateur record for several years till it was beaten by Commander C. B. Fry.

Shortly before his death he was nominated M.B.E. for services in connection with his war-work.

A man of science, a fine sportsman, a generous host, and a charming companion, he leaves behind him a host of friends.  
*Multis ille bonis flebilis occidit.* [T. F. BOURDILLON.]

WILLIAM HARRIS, Government Botanist and Assistant Director of Public Gardens in Jamaica, was born at Enniskillen on the 15th November, 1860, and after some years' experience in gardening, was in 1879 taken on the staff at the Royal Botanic Gardens, Kew. Two years later he was appointed on the Director's recommendation to take charge of King's House Garden, Jamaica, Sir Daniel Morris, K.C.M.G., then being Director of Public Gardens and Plantations, and in due course acted as Superintendent in each of the five gardens in that island. On Mr. W. Fawcett's retirement in 1908, Harris became Superintendent of the Public Gardens of the Department of Agriculture; in 1917 he was appointed Government Botanist, and in 1920, a few months before his death, was promoted to be Assistant Director. By his loss botanical exploration in Jamaica has suffered greatly. He was an indefatigable collector, and spent his holidays in the botanical exploration of every part of the island, roughing it in the bush, with the most meagre shelter for the night. Last year he suffered throat trouble, and went to Kansas City, where his eldest son was living, to consult a specialist. The disease was found to be cancer, and he died in hospital on the 11th October, 1920. He had been a Fellow of the Linnean Society since 6th April, 1899.

Botanically he is commemorated by the genera *Harrisia*, Britton (Cactaceæ), and *Harrisella*, Fawc. & Rend. (Orchideæ), and many species have been named after him. [B. D. J.]

JOHN READER JACKSON, who died at Lymington, Devon, on the 28th October, 1920, was the last survivor of the official staff of the Royal Botanic Gardens, Kew, from the time of Sir William Hooker.

He was born at Knightsbridge in May 1837, but at the age of six he was taken with the rest of the family to Canterbury. His early education was conducted by his father until 1851, when he was sent to London, where he continued his studies under the supervision of an uncle. Having become acquainted with Prof. Thomas Bell, then President of the Linnean Society, he was in turn introduced to Sir William Hooker, Dr. John Lindley, and Robert Brown, resulting in his receiving the appointment as Curator of the Museum at Kew, then in course of formation, which he carried on alone for nearly 20 years, when an assistant was granted. Although his official duties engrossed nearly all his time, he managed to become the author of several works, such as the 'Official Guide to the Kew Museums,' which, originally the work of Daniel Oliver, in the fifth edition, 1871, and sixth edition, 1875, were added to by John R. Jackson; he also edited a new edition of Barton & Castle's 'The British Flora medica' in 1877, and issued his 'Commercial Botany of the Nineteenth Century' in 1890. In addition he contributed numerous short articles to serials, as one on the Whangee Cane in the 16th volume of our

Journal (Botany), many on medicinal plants to the 'Pharmaceutical Journal' and 'Chemist and Druggist,' 'The Gardeners' Chronicle,' and 'The Technologist.'

On reaching the age of 65 in 1902, he left Richmond and settled at Lympstone, where he lived until his death as recorded above. He was elected an Associate on the 2nd April, 1868, and was therefore the oldest Associate in the list by eleven years.

[B. D. J.]

For some time before his death, at his residence on Putney Heath, on the 7th May, 1921, Dr. GEORGE BLUNDELL LONGSTAFF, M.A. (Oxon), had been in ill-health, so that the announcement of his death was not unexpected. He was the son of a medical man at Wandsworth, George Dixon Longstaff, M.D., and was born on the 12th February, 1849, educated at Rugby, and New College, Oxford (Scholar, First Class in Natural Science), where an accident early in his academical career destroyed the sight of one of his eyes, afterwards at St. Thomas's Hospital, London. Much of his time was subsequently devoted to municipal and philanthropic work; for four years, 1889-1903, he was a member of the London County Council, and was also a Vice-President of the Statistical and Entomological Societies. In 1912 he published his 'Butterfly Hunting in Many Lands,' the fruit of his varied travel; his recreations were chiefly entomology, botany, and travelling. He became a Fellow of the Linnean Society on the 19th June, 1913, but had been previously a frequent visitor with Mrs. Longstaff, who had been elected in 1908. Besides the Societies already mentioned, Dr. Longstaff was a Fellow of the Geological and Chemical Societies.

[B. D. J.]

The recent death of Prof. ALFRED GABRIEL NATHORST has been felt, not only in the domain of palaeobotany, but in a wide circle of friends, many of them in this country. He was born in 1850, but after he had reached man's estate, his life was practically spent in the service of the State Museum in Stockholm.

The question of assigning better accommodation for the botanical portion of the collections belonging to the Academy of Science, including an intendant for the palaeobotanic subdivision, was mooted in 1881, and strongly supported by Baron Nordenskiöld in the Rigsdag, but without immediate success. The following year the application was again put forward, and now coupled with the request that "Doctor of Philosophy Alfred Gabriel Nathorst may be appointed for life, or till he be appointed to some other state service"; this was secured in 1884. The building assigned to the new subdivision and its head was in Wallengatan, in a two-storied building, well-remembered by all who have since then visited Nathorst in his corner room, and where so much of his scientific work was done, with the library close at hand. The building itself was old, and at the opposite end to Nathorst's room, cracks showed themselves, even before the contents could be removed into the new building at Frascati, now termed

“Vetenskapsakademien, Stockholm,” as a postal address. Nathorst himself has drawn up the official account of the palaeobotanical section in the quarto volume, ‘Naturhistoriska Riksmuseets historia, Stockholm’ [printed at Uppsala, 1916], pp. 245-273.

Secure in this quiet workroom, Nathorst spent the rest of his official life, save when absent on exploring expeditions or scientific visits. One great disadvantage he had, that of total deafness, but it was marvellous to see how quickly he grasped the purport of a question, even when only a few words had been written down on his tablets. His daughter, Fröken Ruth Nathorst, frequently acted as her father's interpreter by finger-speech. The writer remembers that when Nathorst was in London for the Centenary of the Geological Society in 1907, he was taking charge of the Swedish visitor by the tube railway from the dinner at the Criterion to Cromwell Road for the reception, when, on emerging from the exit of the station in the darkness, Nathorst instantly gripped his arm and gave the name of the street they were entering.

The new buildings were occupied in 1916; and the next year Nathorst attained the age of 67, when he was obliged to retire on account of age. He continued his work till the autumn of last year, in spite of some slight heart-attacks, but at last he had to lay down his pen, and after some weeks of increasing debility he breathed his last on the 29th January, 1920.

Beginning in 1869 with a paper on the Cambrian rocks of Scania, he was occupied with recent Arctic plants and plant-remains in several papers published in Swedish journals and one in the English ‘Journal of Botany’ for 1873, meanwhile gradually tending towards research on fossil plants, as his contribution to Sweden's fossil flora in the Stockholm ‘Handlingar’ of 1876, and his interesting account of *Williamsonia* flowers from Yorkshire in the ‘Öfversigt’ for 1880 show. He was elected a Foreign Member of our Society in 1908.

In later years he elaborated new methods of investigation, as the application of collodion to fossils, which, when set, was stripped off and mounted on slides, which, when examined by the microscope, showed the stomata distinctly.

As for his explorations, he visited Spitzbergen in 1870 and 1882, bringing home rich collections; in 1898 he led an important expedition primarily to Beeren Island and Kung Karls Land in search of Andrée; the account of the latter came out in two volumes in 1900, and the scientific portion in a series of papers.

In 1875 he began a long series of papers on the Rhaetic flora of Scania, and we owe to him much of our present-day knowledge of the Arctic floras from Devonian to late Tertiary times; he also published on Jurassic plants from Graham Island, Japan, New Siberian islands, and the Yorkshire coast. A large number of genera was established by him, amongst them *Pseudobornia*, *Lycostrobus*, *Cephalotheca*, *Wiclandiella*, *Cycadocephalus*, and *Camptopteris*; to him also we owe the term Cycadophyta. [B. D. J.]

ROBERT ALLEN ROLFE. On April 18th of the present year Robert Allen Rolfe, an Associate of the Society for 36 years, was laid to rest in Richmond Cemetery under a pall of glorious orchids,—the last and fair tribute of the great establishment he had served, and of the friends who were united with him in the cult of that noble family. With him a hard and earnest worker, driven by a deep and unwavering enthusiasm that amounted almost to a religion, has gone from us. Neither endowed with the liberal education and the broad outlook of a Lindley nor with the domineering self-sure personality of a Reichenbach, he has yet, from a comparatively moderate position and constrained by a multitude of divergent duties, created for himself a world-wide reputation as an orchidologist whose loss will be felt for a long time.

He was born at Ruddington, a small village near Nottingham, on May 12th, 1855. He was brought up as a gardener, and was for some time employed in the gardens in Welbeck Abbey, the seat of the Duke of Portland. It was from there that he came to Kew in 1879; but already in the following year he was appointed an assistant in the Herbarium, winning the post in a competitive examination against eight other candidates. He was early brought into contact with the Orchidaceæ, and his first publication in that direction was a "Revision of the Genus *Phalænopsis*" in the 'Gardeners' Chronicle' of 1886 (vol. xxvi.). Other papers and notes on orchids followed in the next years, but it was not until 1893, the year when he founded the 'Orchid Review,' that he concentrated his efforts on the Orchidaceæ. The 'Orchid Review,' the special organ of the Orchid growers, remained his faithful ward and companion to the end of his life, whilst the more exclusively scientific results of his studies in Orchidaceæ are spread over various journals and the two great floras of Tropical Africa and South Africa ('Flora Capensis'). The Linnean Society especially owes him a paper on the genus *Vanilla* (Journ. vol. xxxi. 1896, pp. 439-478) and the section of the Orchidaceæ of the 'Index Floræ Sinensis' (Journ. vol. xxxvi. 1903, pp. 5-67). The numbers of new species of Orchidaceæ described by R. A. Rolfe amounts to many hundreds, the 'Kew Bulletin' alone being responsible for the publication of almost 500 under the title "New Orchids." His output does not rival in numbers the prodigious figures realised by Reichenbach and some modern authors, but in thoroughness it compares well with any of them, and this is ungrudgingly recognised in letters which have come to hand since Rolfe's death from France, Germany, Austria, Switzerland, and America, whilst in his own country his authority was unchallenged. However, the Orchidaceæ were not the only field where he left his mark. In an institution like Kew no one can specialize in any one branch to the exclusion of all others. The demands on its workers are manifold and the opportunities endless. So found Rolfe himself, occupied with research work here and there outside the domain of his favourite studies, partly in

the execution of his duties and partly following the temptations of alluring problems. But it is characteristic of the man that all those excursions into side paths ran along definite lines with a starting-point in early days, so his work on galls (first paper 1881), Selaginaceæ (1883), the flora of the Philippines (1885), hybrids (1887), etc. His keen interest in the problem of hybridisation led him on to the study of the species of *Rosa* and *Rubus*, but here, like many others, he never came to any settled conclusions, and his work remained shut up in the cabinets of the Herbarium, or perhaps found a new sprouting ground in a congenial mind, for he was communicative enough when he got warm and found a willing ear.

R. A. Rolfe was to have retired from the post of an Assistant in the Herbarium of the Royal Botanic Gardens, Kew, last year, but extension of service for one year was granted. This he did not live to complete. His last illness and death came unexpectedly early, for until then he showed, apart from increasing deafness, no signs of old age, and was full of plans for future work and even for a journey of exploration to Central America. He was an Honorary Fellow and Member of the Royal Horticultural Society, and shortly before his death was awarded by the same Society the Victoria Medal and the Gold Medal of the Veitch Memorial Trust Fund.

Further references to his life and work may be found in the 'Kew Bulletin' for 1921, pp. 123-127, and in the 'Orchid Review,' vol. xxix. pp. 5-8. Portraits of him were published in the 'Gardeners' Chronicle' of 12th February and 23rd April of the present year, and in the 'Orchid Review,' *l. c.*

R. A. Rolfe married, in 1881, Miss Caroline Berkeley Thatcher, of Clifton and Cheddar, by whom he is survived, as well as by one daughter and three sons. [O. STAFF.]

PIER' ANDREA SACCARDO was born at Treviso, on the 23rd of April, 1845, the son of the engineer, Francesco, of Selva (Volpago), and his wife Elena, born Vidotta, of Treviso. His early education was received at Selva and afterwards at Venice, and subsequently at Padua, at which University he graduated in medicine and in philosophy in 1866.

His earliest employment on emerging from his University was Assistant to Roberto de Visiani, entering upon his duties in November 1866, retaining the post until 1872, when he was appointed Professor of Natural History at the Technical Institute of Padua, then newly founded, until Visiani retired from the Chair of Botany, and Saccardo was called to fill his place in 1877 as Professor and Director of the Botanic Garden, which was confirmed upon the death of Visiani in February 1878. He remained there for the long period of forty-two years, retiring on reaching the age of 70 in 1915.

Padua being threatened with bombardment as a consequence of the disaster of Caporetto in November 1917, he removed to Avellino to the house of his son-in-law, Prof. Trotter, who had married his daughter Maria, staying there till June 1919, when he went back to Padua. A short illness, which did not at first seem serious, carried him off on 11th February, 1920.

It is said that Saccardo's first attempt at the study of botany was in 1857, a boy of twelve, when an uncle had planted an orchard with ticketed specimens; upon this the youngster began to collect and determine the plants of the countryside, and followed up his acquisition of this herbarium by establishing a small botanic garden at Selva. His 'Prospetto della flora trevigiana' was his first printed botanical work; it came out during 1863-64 in the Venetian 'Atti,' and its success seems to have been the determining cause of his devotion to botany; a revision was issued in 1917, one of his last efforts, as 'Flora Tarvisina renovata.' His attention was then attracted to cryptogams, mosses at first, and the 'Mycologiae Venetæ Specimen' (1873) betrayed the mycologist, who was destined to work so strenuously amongst the fungi. Armed with microscope and micrometer, and gifted with a retentive memory, he issued in succession 'Fungi Veneti novi vel critici' (1873-82); 'Notæ mycologicae,' ended in 1918; 'Mycotheca Veneta,' a set of 1600 dried specimens, and 'Fungi italici autographice delineati' (1877-86), 1500 plates, the originals being drawn and coloured by the author. In the late 'seventies Saccardo initiated the journal 'Michelia.'

His 'Conspectus generum Pyrenomycetum italicorum systemate carpologico distributorum' shows that he had been studying the problems of mycology so as to evolve a system founded upon the forms of fruit, a scheme which our own countryman, M. C. Cooke, attacked as artificial and better adapted for the use of girls and idle brains, which was vigorously answered by Saccardo. During this time he was busy on the great work of his life, 'Sylloge fungorum,' the first volume of which saw the light in 1882, and closed with the 22nd volume in 1913, having 72,000 species, with MS. material in addition, which would bring up the number to 80,000. Help in this vast work was received from Berlese, De Toni, Trevisan, Sydow, his son Domenico, his son-in-law Trotter, and many others.

A full bibliography of the work of our late Foreign Member will be found in the 'Nuovo Giornale Botanico Italiano,' n. s. xxvii, (1920) pp. 58-74, by Dr. Domenico Saccardo, which is immediately followed by a posthumous paper, "Mycetes boreali-americanis," of fourteen pages. He was elected one of our Foreign Members on the 4th May, 1916. [B. D. J.]

HENRY FREDERICK CONRAD SANDER was born in 1847, and early in life was employed by Messrs. James Carter at their nursery at Forest Hill. Whilst here he met with Benedict Roezl, the



well-known plant collector, with whom he entered into a business arrangement: Roezl to collect, and Sander to receive and dispose of the specimens.

Sander started in business on a very modest scale in George Street, St. Albans, but by 1873 Roezl's consignments of orchids and other exotics became so extensive that he decided to erect a suitable glasshouse, much of which was put up with his own hands. The business proved so successful that in 1881 he established the present large nursery outside the town of St. Albans. At one time he employed no fewer than 23 collectors in different parts of the world, and his importations became so large that he held sales of orchids four days a week in London. During this decade he established a branch in New Jersey, U.S.A., but as the distance from home was great, it was sold. In 1894 an important step was taken by founding a new nursery at St. André, near Bruges, which grew into a large undertaking, with 100 glasshouses, 30 being given up to orchids; his three sons were associated in the business.

The luxurious folio volumes of 'Reichenbachia' were due to his liberality: he received the Victoria Medal of Honour upon its establishment, was Chevalier of the Order of the Crown of Belgium, and was elected F.L.S. on the 2nd December, 1886. He died at Bruges after an operation on 23rd December, 1920, and was buried in the cemetery of St. Albans on the 30th of the same month. [B. D. J.]

Dr. FRANZ STEINDACHNER, who was elected a Foreign Member of the Linnean Society in 1887, died at Vienna on 10th December, 1919, aged 85. He was a student and friend of Louis Agassiz, and devoted the greater part of his life to systematic ichthyology. He was especially interested in freshwater fishes, and himself made large collections during various journeys in Spain and Portugal, California, and Brazil. Early he joined the staff of the Natural History Museum in Vienna, where he arranged his collections and prepared a long and valuable series of papers and memoirs published chiefly by the Vienna Academy of Sciences. His pioneer contributions to our knowledge of the freshwater fishes of Spain, Portugal, and Brazil are especially noteworthy. He also published some of the first detailed descriptions of fossil fishes from the Tertiary formations of Austria. At the Museum, Steindachner took immediate charge of the reptiles and amphibians as well as fishes, and he occasionally wrote on the new forms received. In 1899 he was promoted to the directorship of the Museum, which he held until his death. Notwithstanding his arduous administrative duties, he still retained his enthusiastic devotion to ichthyology, and he always seemed to have leisure to meet and discuss his favourite study with his younger colleagues. He lived in the official dwelling beneath the Museum, and his genial hospitality, for many years dispensed with the aid of his

sister, will always be remembered with pleasure by those who had the good fortune to experience it. He was a great naturalist, worthy of the esteem and affection in which he was held.

[A. S. W.]

Excluding perhaps the late Sir Dietrich Brandis and Mr. Gamble, no other Indian forester in recent years has done so much to add to our knowledge of systematic botany in India as WILLIAM ALEXANDER TALBOT, whose sad death occurred in Switzerland on the 23rd July, 1917.

Mr. Talbot came to Switzerland in 1911 shortly after retirement from the Indian Forest Service, bringing the greater part of his valuable herbarium with him, and accompanied by his sister who had been his devoted companion for so many years in India. Soon after arrival he purchased the historic mansion known as the Château de Rougemont, situated in the Canton Vaud, hoping to spend the remainder of his days midst the ideal surroundings of that beautiful spot in useful botanical work; but this he was not permitted to do for very long. He only survived in Switzerland for a comparatively short time, namely, six years.

About six months or so before his death, he complained of a feeling of weariness and disinclination for further botanical study; a rest was suggested, and it was thought that after this he would be able to resume his passionately-loved work, but such, unfortunately, was not the case. His health rapidly declined, and he passed peacefully away at the comparatively early age of 62 years, 34 of which were spent in the Bombay Forest Department.

Mr. Talbot, who was an Irishman, was educated at Foyle College, County Londonderry—a college which had the honour of turning out two brothers, Lord and Sir Henry Lawrence of Indian Mutiny fame. John Nicholson, the hero of Delhi, it is interesting to note, hailed from an institution close by in the same county.

After passing an examination in London for the Indian Service, he was sent to the Forest School at Nancy in the Vosges for a three years' course of study in forestry. Having completed this course, he went out to Bombay and arrived there in December 1876, being posted as an Assistant Conservator of Forests, to the Thana District, a district situated at the foot of the western projection of the Ghats. Here, however, he was not permitted to remain very long; after a few months he was transferred to Khandesh, on the Deccan table-land. It was while serving in Khandesh that an episode occurred which very nearly terminated Mr. Talbot's career. When out shooting on one occasion in the Satpura Hills, a magnificent wounded bison charged him in the bamboo jungles there. Many would have been unable to know what to do in such an emergency, but Mr. Talbot with great presence of mind lay flat on the ground, permitting the infuriated bison to pass over his prostrate form.

After a stay of a few months in Khandesh and Kolaba respectively, he was moved in 1878 to the Southern Circle of the Bombay Presidency, in which are comprised the splendid high seedling forests of North Kanara, forming as they do an unbroken chain of about 3000 square miles of tropical woodland.

One can imagine what pleasure and delight arrival in this region must have afforded Mr. Talbot. With his keenness for big game shooting and love of botany, here were conditions of an ideal character for him, which he did not fail to take advantage of to the fullest possible extent, especially as he had the good fortune to be left undisturbed in this region for seventeen years, or half his total period of service. This was probably due to his having soon gained the confidence of his chief, Col. Peyton, the Conservator, who was an intrepid sportsman and keen lover of nature, and he recognised in Mr. Talbot the very man to do full justice to the situation in which he was placed.

It was while out on shooting expeditions with Col. Peyton and excursions with others, that Mr. Talbot, aided by his trained powers of observation, was able to collect the store of botanical information which he put together in book form first in 1894. This was his first modest attempt at a systematic work on the trees, shrubs, and climbers of the Bombay Presidency, and it was published under the authority of the Bombay Government. Several new species were included in this work, as well as numerous others not first noted as found in the Bombay Presidency.

Eight years of further close botanical work enabled him to bring out in 1902 another and much enlarged edition of his first book, which was again published by Government and contained still more trees, shrubs, and climbers new to science and several other species also not known to exist previously in the Presidency.

But Mr. Talbot was now reaching senior rank, and it became necessary to transfer him from Kanara to a post of an administrative character. Much to his chagrin accordingly, he was moved in 1903 to assume control of the Northern Forest Circle of the Bombay Presidency. It was while in administrative charge of this circle that the idea of bringing out an illustrated and much enlarged edition of his previous work, 'Forest Flora of the Bombay Peninsula and Sind,' Poona (1909-11), 2 vols., 4to, took concrete form. With the co-operation of his sister, who is a talented artist, and who is responsible for the illustrations in the book, which are mostly from nature, he started on this laborious and ambitious task. They both worked assiduously together on this *magnum opus* for eight years, *i.e.* till 1910, when Mr. Talbot's enforced retirement from the service owing to age (55 years) was brought about. This work, however, was practically completed, and it was published by Government at a cost of Rs. 15,000, *i.e.* about £1000. Mr. Talbot was given an honorarium of Rs. 5000, *i.e.* £333, for his service and 50 free copies for presentation to friends.

Realising the heavy and responsible duties attached to the post of an administrative officer in charge of a circle, the completion of this last work, consisting of two volumes of quarto size and 1143 pages with 543 illustrations, while actually in harness, cannot but be characterised as a great achievement, reflecting the greatest credit on the author.

For the last three years of his service Mr. Talbot was senior Conservator of Forests in Bombay and adviser of Government on all forest questions, and resided at Poona and Mahabaleshwar, both hill stations and summer resorts of Government; but the social attractions of these places never appealed to him. He was by nature of a shy, retiring disposition, preferring the companionship of his sister and a few friends to the usual gaieties and pleasures that are associated with life at hill stations.

Very great sympathy is felt for Miss Talbot, who has never recovered from the shock of her brother's death, and who is still in Switzerland lamenting his loss. [G. M. RYAN.]

HERMANN VÖCHTING was born in Blomberg, on the 8th February, 1847, the son of a market-gardener, and with his two brothers and a sister he passed his early childhood among flowers. After his schooldays he spent 16 years as under-gardener in the princely garden of Detmold. During this period he began his botanic training, and was helped by an apothecary, Wessel, in Detmold, the author of a local flora of the Princedom of Lippe. From this place he passed at the beginning of 1867 to an assistant's place in the Berlin Botanic Garden, when Alexander Braun was Director, and largely through his influence he studied the kindred sciences and mathematics, Ascherson, Kny, and Pringsheim being amongst his teachers in botany. In 1870 he returned to Blomberg, and in 1871 he issued his first paper, on *Myriophyllum*; and in the same year he spent three months at Kew for improvement. The next year, 1872, Pringsheim, who had a strong belief in his pupil's powers, offered him the post of assistant in his private laboratory, which offer was joyfully accepted. Whilst here Vöchting prepared for the examination for the doctorate, which he obtained at Göttingen in 1873. The April of the following year he became assistant to Hanstein at Bonn. When Pfeffer removed to Basel in 1877, Vöchting succeeded him at Bonn, and the next year he succeeded to Pfeffer when the latter removed to Tübingen. In 1887, Pfeffer again migrated, this time to Leipzig, and for the third time Vöchting again occupied his vacated position, and at Tübingen he passed the remainder of his days. Soon after his 70th birthday in February, 1917, his health began to fail, and a summer holiday in Switzerland failed to restore it; at a Basel hospital he was informed that his state was hopeless from internal cancer; he journeyed home to Tübingen, and after some months of hospital treatment, died on the 25th November, 1917.

His preliminary treatise has already been cited, but, in addition, may be named 'Bildung der Knollen,' 1887: 'Transplantation

an Pflanzenkörper,' 1892; 'Einfluss des Lichtes auf der Blüten,' 1893; 'Blüthen - Anomalien,' 1898; 'Knollengewächse,' 1899; 'Anatomie und Pathologie des Pflanzenkörpers,' 1908.

The writer twice met Prof. Vöchting—once when he spent some time in London, and more recently when he came over in 1909 to receive the honorary degree of Sc.D. at the Darwin Celebration at Cambridge in 1909. The recollection will always be retained of a charming and unassuming personality, with the gladness of a child and the wisdom of an old man; the great war brought sadness to him, two of his sons being killed in action. His election as a Foreign Member was comparatively recent, namely, on the 1st May, 1913. [B. D. J.]

JULIUS VON WIESNER died in October 1915, and was buried on the 12th of that month. He was born on the 20th January, 1838, the youngest of a family of eight, at Tscheschen in Moravia, whence the family removed to Brünn when the subject of our memoir was quite young. From 1849 he was at the Gymnasium at Brünn when Mendel was teaching from 1854–1868; he settled in Vienna in 1858, and here among his teachers were Fenzl, Unger, and Ettingshausen. At the age of 22, in the year 1860, he took the degree of Ph.D. at Jena, became extraordinary Professor of Physiological Botany in 1868 at the Polytechnic Institute in Vienna, and two years later, full Professor at the Forest Institute at Mariabrunn, followed in 1873 by his appointment as Professor of Anatomy and Physiology of Plants at Vienna University, and from 1880 he withdrew from teaching at the Polytechnic so that he might concentrate his efforts on his work at the University, where he was destined to devote 36 unbroken years; then, in consequence of attaining the age limit, in 1909 he retired.

Amongst his best known works may be mentioned 'Die Rohstoffe des Pflanzenreiches,' Leipzig, 1873, ed. 2, 1900; 'Die Entstehung des Chlorophylls,' Wien, 1878; 'Das Bewegungsvermögen der Pflanzen; eine Kritische Studie über das gleichnamige Werk von C. Darwin,' 1881; 'Elemente der Anatomie und Physiologie der Pflanzen,' which attained a fifth edition in 1906; whilst his researches on the influence of gravity on leaves, autumnal leaf-fall, the conservation of chlorophyll and the action of light on plants, etc., are well known and appreciated.

He was elected a Foreign Member on the 1st May, 1902; he was happy in having a fortunate youth, a quick and successful career, sound health, long life hardly touched by care, an ample output of scientific work, preserving throughout an optimistic view. [B. D. J.]

June 2nd, 1921.

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the Anniversary Meeting of the 24th May, 1921, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

The President announced that he had appointed the following to be Vice-Presidents for the ensuing year:—Mr. E. T. BROWNE, Mr. C. C. LACAITA, Mr. HORACE W. MONCKTON, and Lord ROTH-SCHILD.

Major Stanley Smyth Flower was admitted a Fellow.

Lekshminarayanapuram Subramania Subramaniam, Murray Ross Henderson, and Professor Walter Garstang, M.A., D.Sc. (Oxon), were proposed as Fellows, and Miss Matilda Smith as an Associate.

Certificates in favour of Miss Winifred Mary Ailsa Lomas, B.Sc., and William Rae Sherriffs, M.A., D.Sc. (Aberd.), were read for the second time.

William Small, M.B.E., M.A., B.Sc., William Frederick Bumsted, F.R.M.S., Reginald Ernest Massey, Prof. Rajkumar Sen, M.Sc., William Edward Hollows, Santi Prosad Sen Gupta, B.Ag., F.R.H.S., Shanker Ganesh Sharngapani, B.Ag., Donald Ward Cutler, M.A., John Noel Milsum, F.R.H.S., and John Hyacinth Power, F.Z.S., were elected Fellows.

Prof. GARSTANG opened a discussion by reading a paper on Recapitulation. He urged that Haeckel's Biogenetic Law was essentially a theory of ancestral heredity. The adult was the creative phase, and "like produced like." Hence ancestors created; heredity transmitted; and development repeated the order of creation. But a generalized recapitulation by ontogeny of the essential grades of ancestral structure was possible without involving successive adult images in the ontogeny; and the morphological test to apply to these rival theories was whether the stages of ontogeny did, or did not, more closely resemble successive adult organisations than the corresponding formative stages of ancestral ontogeny in cases where the ancestry was sufficiently known. This morphological test was invariably in favour of what

might be called the "persistence theory" of recapitulation, and against the theory of accelerated adult incorporations. A tiny stalked larva was probably a feature of every Crinoid from Cambrian age to the present; the heterocercal tail of a Teleost larva was found in the larval as well as in the adult stage of a Sturgeon; the "*Emarginula*" stage of *Fissurella* was much closer to the early post-larval stage of *Emarginula* than to its final condition; the larval *Portunion* lacked the last thoracic feet, like every other Isopod larva; and a Tadpole resembled the larva of a *Polypterus* or Dipnoan far more closely than it resembled the adult of any possible Piscine or Stegocephalic ancestor.

The so-called law of "tachygenesis" had been made much of by palæontologists. But in the case of Ammonites we had no means of distinguishing between environmental influences and hereditary factors. The *Echinospira* larvæ of *Lamellaria* showed how deeply environmental influences might affect the growth of pelagic shells, so as to produce a cyclical series of changes as complete as in any Ammonite, yet independent of any influence from successive adult ancestors.

The discussion was continued by Prof. E. W. MacBride, F.R.S. (visitor), Dr. F. A. Bather, F.R.S. (visitor), Prof. E. S. Goodrich, F.R.S., Sec.L.S., Dr. D. H. Scott, F.R.S., Dr. W. Bateson, F.R.S., Dr. W. D. Lang (visitor), Mrs. C. B. Hodson, and the President, Prof. Garstang replying.

Prof. E. S. Goodrich agreed with Prof. Garstang that an organism in its development does not recapitulate its phylogeny, but merely tends to repeat the ontogenetic stages of its immediate ancestor. He pointed out a fundamental fallacy in the argument for Recapitulation when it assumes that organisms start their development from the same point as their ancestors. Taking for instance the Fish, Amphibian, Reptile, and Mammal, as stages in phylogeny, the Amphibian does not start as a Fish, travelling along the same road and proceeding a little farther. Still less does the Mammal start as a Fish or Amphibian or even a Reptile; its egg is mammalian from the first. The successive stages differ essentially as much from each other in the egg as they do in the adult. In so far as they tend to pass through the same developmental stages as their near ancestor, it is because they start with approximately the same complex of transmitted factors of inheritance and develop under the same conditions. *Phenacodus*, *Hyracotherium*, *Mesohippus* may be considered to represent stages in the phylogeny of the horse. But we may infer that if the one-toed Horse passes through a three-toed stage, it is because its near ancestor the three-toed *Mesohippus* had an embryo with three well-developed toes; and so on down the series. Such cases may be compared to the alleged instances of recapitulation among Ammonites and other fossil Invertebrates. The case of the Brazilian tortoise, cited by Prof. MacBride, differs in no essential from that of *Portunion*. The tortoise passes through a "chelonian" hard-shelled stage before it becomes soft and adapted to life in

crevices, just as the Isopod passes through a crustacean stage before becoming adapted to a parasitic life. In these the divergence between the old and the new mode of life takes place late, and the modification is in the "adult" stage only; but in other organisms, of course, it may take place at any point in the ontogeny.

June 16th, 1921.

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 2nd June, 1921, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Mr. Albert Edward Mills, Mr. Henry Ball, and Mr. Arthur Mayfield, were admitted Fellows.

Miss Kathleen Bever Blackburn, M.Sc. (Lond.), was proposed as a Fellow.

The following certificates were read for the second time:—Lekshminarayanapuram Subramania Subramaniam, Murray Ross Henderson, and Prof. Walter Garstang, M.A., D.Sc. (Oxon); as an Associate, Miss Matilda Smith.

Messrs. George Tertius Dickson, John Francis Donald Tutt, James Robert Ainslie, James Walter White, Thomas Hayton Mawson, Prof. Thomas Wibberley, and Charles Taborn, were elected Fellows.

The first communication was by Mr. ALFRED O. WALKER, who had sent from his garden a supply of capsules from one plant of *Papaver umbrosum*, hort., which botanists regard as a variety of the Corn-poppy, *P. Rhœas*, showing carpelody of the stamens. The General Secretary showed an illustration of a similar occurrence in another variety of the same species, *P. Rhœas* var. *commutatum*, in Worsdell's 'Plant-teratology,' vol. ii. p. 182, pl. 45. Dr. Rendle pointed out that the satellite carpels contained imperfect ovules. Mr. Henry Ball and Mr. R. Paulson also took part in the discussion.

Mr. WILFRED MARK WEBB exhibited a specimen of a woodlouse rare in Britain, *Ligidium hypnorum*, which he had found in Berkshire recently; its previous records were Surrey in 1873 by



the Rev. T. R. R. Stebbing and 1902 in Essex by himself. Prof. E. S. Goodrich, Sec.L.S., made a few remarks upon the exhibition.

[Since the Meeting Mr. R. S. Bagnall, F.L.S., has reported that Dr. W. E. Collinge has also recorded this species, "whilst I have taken it in very large numbers in the Bath district, and this Easter a single specimen in Lancashire. In the Bath district it is one of the commonest of species."]

Prof. A. H. REGINALD BULLER, introduced by Dr. A. B. Rendle, Sec.L.S., gave a discourse "Upon the Ocellus Function of the Subsporangial Swelling of *Pilobolus*." He stated that the subsporangial swelling of *Pilobolus* functions, not merely as part of a squirting apparatus, but also as an ocellus, which receives the heliotropic stimulus which causes the stipe to turn the fungus gun toward the light. The swelling is transparent and refracts light, like the bulb of a Florence flask filled with water. Its diameter is always greater than that of the black sporangium which it supports.

The sporangiophore of *Pilobolus* appears to be the only ortho-heliotropic plant organ known which takes up its positively heliotropic position owing to the possession of a special light-perceiving cell-structure.

*Pilobolus* may well be described as a fungus with an optical sense-organ or simple eye; and, in using its eye for laying its gun, it appears to be unique in the plant world.

The paper was illustrated with models. A fuller account of the *Pilobolus* eye is about to appear in the 'Transactions of the British Mycological Society.'

A discussion followed in which these were engaged: Mr. E. J. Butler, Prof. R. R. Gates, and Capt. Ramsbottom, Prof. Buller replying.

Major R. B. SEYMOUR SEWELL, I.M.S. (visitor), read a paper by Dr. N. ANNANDALE (who was prevented by illness from presenting the paper himself), entitled "The vegetation of an island in Chilka Lake on the east coast of India, considered as a preliminary to a study of its fauna," of which the following is an abstract:—

In order to appreciate the fauna of a small island in the Chilka Lake on the east coast of India, the Author has found it necessary to study the vegetation. The area of the island is about one-third of a square mile, and the rocks are composed of garnet-bearing quartzite which yields an infertile and scanty soil on weathering. The climate is relatively dry. The vegetation consists mainly of trees, shrubs, and perennial creepers, with a great scarcity of herbs, ferns, and epiphytes, and a complete absence of palms, bamboos, screw-pines, and orchids. The genus *Ficus* has the largest number of species (7); the commonest tree is the Nim (*Azadirachta indica*), the commonest shrub *Glycosmis pentaphylla*, and the commonest creeper *Vitis quadrangularis*. Several distinct

zones of vegetation can be distinguished. The most interesting is the central thicket, in which *Ficus gibbosa* is rapidly replacing *F. bengalensis*, giving space also, by its less spreading habit, for trees and shrubs of other genera. The peculiarities of the fauna, and especially its deficiencies and generalized character, can be correlated directly with the vegetation.

The slides which followed were explained by Major Sewell.

Col. M. J. GODFREY read his paper on the fertilization of the orchid genus *Cephalanthera*, as observed by him in the south of France on *C. rubra*, *C. ensifolia*, and *C. grandiflora*, the last being the species which was studied by Darwin. The Author holds that *Cephalanthera* is an old genus, existing before *Epipactis* came into being, and was not derived from the latter.

Dr. Rendle commented on several points of interest in the paper, and a question was put by Mr. T. A. Dymes which was answered by the Author.

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## BENEFACTIONS.

*LIST in accordance with Bye-Laws, Chap. XVII. Sect. 1, of all Donations of the amount or value of Twenty pounds and upwards, received during the past Twenty years.*

## 1901.

Hon. Charles Ellis, Hon. Walter Rothschild, Frank Crisp, Esq., F. D. Godman, Esq., and the Bentham Trustees: The Correspondence of William Swainson.  
 Royal Society: Contribution towards Mr. F. Chapman's paper on Funafuti Foraminifera, £50.  
 Prof. E. Ray Lankester: Contribution towards illustration, £30 5s. Portrait of Dr. St. G. J. Mivart, presented by Mrs. Mivart.

## 1903.

Royal Society: Contribution toward Dr. Elliot Smith's paper, £50.  
 Legacy from the late Dr. R. C. A. Prior, £100 free of duty.  
 Mrs. Sladen: Posthumous Portrait of the late Walter Percy Sladen, by H. T. Wells, R.A.  
 B. Arthur Bensley, Esq.: Contribution to his paper, £44.

## 1904.

Royal Society: Grant in aid of third volume of the Chinese Flora, £120.  
 Frank Crisp, Esq. (afterwards Sir Frank Crisp, Bt.): Cost of Supplementary Royal Charter.  
 The same: Bulliard (P.). *Herbier de la France; Dictionnaire; Histoire des plantes vénéneuses; Champignons*, in 10 vols. Paris, 1750-1812.

## 1905.

Royal Society: First grant in aid of Dr. G. H. Fowler's 'Biscayan Plankton,' £50.  
 Executors of the late G. B. Buckton, Esq.: Contribution for colouring plates of his paper, £26.

## 1906.

Royal Society: Second grant towards 'Biscayan Plankton,' £50.  
 Subscription portrait of Prof. S. H. Vines, by Hon. John Collier.  
 Royal Swedish Academy of Science: Copies of portraits of C. von Linné, after Per Kräftt the elder, and A. Roslin, both by Jean Haagen.

## 1907.

Royal University of Uppsala : Copy by Jean Haagen of portrait of C. v. Linné, by J. H. Scheffel (1739).

Royal Society : Third and final grant towards 'Biscayan Plankton,' £50.

The Trustees of the Percy Sladen Memorial Fund : First grant towards publication of Mr. Stanley Gardiner's Researches in the Indian Ocean in H.M.S. 'Sealark,' £200.

## 1908.

Prof. Gustaf Retzius : Plaster cast of bust of Carl von Linné, modelled by Walther Runeberg from the portrait by Scheffel (1739) at Linnés Hammarby : the bronze original designed for the façade of the new building for the Royal Academy of Science, Stockholm.

Miss Sarah Marianne Silver (afterwards Mrs. Sinclair), F.L.S. Cabinet formerly belonging to Mr. S. W. Silver, F.L.S.

## 1909.

The Trustees of the Percy Sladen Memorial Fund : Second grant towards publication of Mr. Stanley Gardiner's Researches in the Indian Ocean in H.M.S. 'Sealark,' £200.

Prof. James William Helms Trail, F.R.S., F.L.S. : Gift of £100 in Trust, to encourage Research on the Nature of Proto-plasm.

## 1910.

Royal Society : Grant towards Dr. G. H. Fowler's paper on Biscayan Ostracoda, £50.

Sir Joseph Hooker : Gold watch-chain worn by Robert Brown, and seal with portrait of Carl von Linné by Tassie.

Prof. J. S. Gardiner : Payment in aid of illustrations, £35 0s. 6d.

Sir Frank Crisp : Donation in Trust for Microscopical Research, £200.

The Trustees of the Percy Sladen Memorial Fund : Third grant towards publication of Prof. Stanley Gardiner's Researches in the Indian Ocean, £200. (For third volume.)

## 1911.

The Trustees of the Percy Sladen Memorial Fund : Second Donation towards the publication of the third volume on the Indian Ocean Researches, £70.

The same : First Donation towards the fourth volume, £130.

## 1912.

The Indian Government: Contribution towards the illustration of Mr. E. P. Stebbing's paper on Himalayan *Chermes*, £46 15s. 2d.

The late Mr. Francis Tagart, £500 free of Legacy Duty.

The late Sir Joseph Dalton Hooker, O.M., G.C.S.I., £100 free of Legacy Duty.

The Trustees of the Percy Sladen Memorial Fund: Second Donation towards the publication of the fourth volume on the Indian Ocean Researches, £140.

The same: First Donation towards the fifth volume, £60.

## 1913.

Royal Society: Grant towards Dr. R. R. Gates's paper on Mutating *Oenotheras*, £60.

Sir Frank Crisp, Bt., Wallichian Cabinets, £50.

The Trustees of the Percy Sladen Memorial Fund: Second Donation towards the publication of the fifth volume, £200.

## 1914.

Royal Society: Grant towards Miss Gibbs's paper on the Flora of British North Borneo, £50.

Miss Foot: Cost of illustration of her paper on *Euschistus*.

The Trustees of the Percy Sladen Memorial Fund: Third Donation towards the fifth volume, £10.

The same: First Donation towards the sixth volume, £190.

## 1915.

The Trustees of the Percy Sladen Memorial Fund: Second Donation towards the sixth volume, £80.

Miss Foot: Cost of second paper on *Euschistus*, £32 10s.

Royal Society: Donations towards the cost of a paper by Mrs. Arber, D.Sc., £40.

The same: towards paper on Utakwa River plants by Mr. H. N. Ridley, C.M.G., F.R.S., £50.

Miss Marietta Pallis: Instalment of cost of her paper on *Plav*, £30.

Thomas Henry Riches, Esq.: Dr. A. R. Wallace's library on Natural History.

Sir Frank Crisp, Bt.: New shelving for Wallace's Volumes.

## 1916.

- Mr. E. Heron-Allen: Contribution to cost of paper on Foraminifera of N.W. Scotland, £44.
- Messrs. H. Takeda and C. West: Contribution towards the illustration of their paper, £40.
- Royal Society: Contribution towards the illustration of two papers by Prof. Dendy, £40.
- The same: Contribution towards Mr. Swynnerton's paper on Form and Colouring, £70.
- The High Commission for the Union of South Africa, per Dr. J. D. F. Gilchrist, for the illustration of his paper on *Jasus Lalandii*, £30.
- Miss Marietta Pallis: Balance of cost of her paper on Play, £90 16s. 6d.
- Sir Frank Crisp, Bt.: Phototyped copy of Dioscorides from the 'Codex Aniciae Juliana' at Vienna.

## 1917.

- British Ornithologists' Union, etc.: Contribution towards cost of Mr. H. N. Ridley's paper, £20.
- The Royal Society: Second contribution towards the printing of Mr. C. F. M. Swynnerton's paper on Form and Colouring, £75.
- Sir Frank Crisp, Bt.: 'Lindenia,' Ghent, 1891-1901. 17 vols. sm. fol.

## 1919.

- Dr. B. Daydon Jackson: MS. index to Linnean Society's Journal, Botany, vols. xxi.-xl. (1884-1912) and the Botanic entries in the 'Proceedings' for the same period.

## 1920.

- The Royal Society: Third contribution towards the printing of Mr. C. F. M. Swynnerton's paper as above, £50.
- The High Commission for the Union of South Africa, for the printing of Dr. J. D. F. Gilchrist's paper on *Jasus Lalandii*, Part II., £60.

## 1921.

- The Percy Sladen Memorial Fund: Additional Grant in aid of publication of 'Transactions,' 2nd ser., Zoology, vol. xvii. part 4, £72 10s.
- The same: Grant in aid of publication of four papers on the Houtman Abrolhos Islands, £100.
- The Royal Society: Donation in aid of papers by Mr. N. E. Brown and Mr. S. L. Moore, £90.
- Dr. W. Rushton Parker: Donation of a large series of portraits of Naturalists and Persons after whom Genera have been named, and work on rearrangement and annotation of the entire collection.

# ADDITIONS AND DONATIONS

TO THE

## LIBRARY.

1920-1921.

---

- Agar (W. E.).** Cytology. With special reference to the Metazoan Nucleus. Svo. London, 1920.
- Arber (Agnes).** Water Plants. A Study of Aquatic Angiosperms. Svo. Cambridge, 1920.
- Arcangeli (Alceste).** Sulla ricerca microchemica del fosforo nei tessuti vegetali. (Atti Soc. Tosc. Sci. Nat. xviii.)  
Svo. Pisa, 1902. **C. C. Lacaita.**
- Il mimetismo nel regno vegetale. (Atti Soc. Tosc. Sci. Nat. xix.)  
Svo. Pisa, 1903. **C. C. Lacaita.**
- Appunti sul tallo dell' *Usnea sulphurea*, Fr. (Atti Soc. Tosc. Sci. Nat. xx.)  
Svo. Pisa, 1904. **C. C. Lacaita.**
- rcangeli (Giovanni).** Esperienze effettuate sopra un piccolo allevamento di Baco da seta. (Atti R. Accad. Georgofili, xxv.)  
Svo. Firenze, 1902. **C. C. Lacaita.**
- Sulle disposizioni igieniche da adottarsi riguardo all'alimentazione per Funghi. (Soc. Ital. Med. Internat. Congr. Med. xi.)  
Svo. Roma, 1902. **C. C. Lacaita.**
- Sul *Tetranjchus aurantii* Targioni-Tozzetti e sul *Tetranjchus telarius* (L.) Dugès. (Agric. Ital. 1903.)  
Svo. 1903. **C. C. Lacaita.**
- Di nuovo sugli avvelenamenti per funghi. (Atti R. Accad. Georgofili (4) i.)  
Svo. Firenze, 1904. **C. C. Lacaita.**
- Per l'inaugurazione dell'esposizione regionale dei crisantemi tenuta in Pisa dal 10 al 20 Novembre, 1904. (Bull. R. Soc. Tosc. Orticol. xxix.)  
4to. Firenze, 1904. **C. C. Lacaita.**
- Sull'esplorazioni polari e sui ghiacci polari. (Proc. Verb. Soc. Tosc. Sci. Nat. xxiv.)  
Svo. Pisa, 1915. **C. C. Lacaita.**
- Alcune altre osservazioni sulla *Victoria regia*, Lindl. (Proc. Verb. Soc. Tosc. Sci. Nat. xxv.)  
Svo. Pisa, 1916. **C. C. Lacaita.**
- Di nuovo sulle piante di *Pinus Pinea* var. *fragilis*, coltivate nell'Orto botanico pisano. (Proc. Verb. Soc. Tosc. Sci. Nat. xxv.)  
Svo. Pisa, 1916. **C. C. Lacaita.**
- Sopra alcuni fossili della Sardegna e di Jano. (Proc. Verb. Soc. Tosc. Sci. Nat. xxv.)  
Svo. [Pisa, 1916]. **C. C. Lacaita.**
- Di nuovo sopra alcune varietà del *Diospyros Kaki* e sul Melanogramma del Kako. (Proc. Verb. Soc. Tosc. Sci. Nat. xxvi.)  
Svo. [Pisa]. **C. C. Lacaita.**

**Arcangeli (Giovanni).** Sopra alcune varietà del *Diospyros Kaki* e sopra una *Malattia riscontrata* in una di esse. (Proc. Verb. Soc. Tosc. Sci. Nat. xxv.) Svo. *Pisa*, 1916. **C. C. Lacaita.**

### Atlases.

An Atlas of Ancient Geography. By **SAMUEL BUTLER.**  
Svo. *London*, 1867.

School Atlas of Classical Geography. By **ALEX. KEITH JOHNSTON.**  
4to. *London*, 1866.

Popular Atlas of the British Isles. By **G. W. BACON.**  
4to. *London*, 1904. *Dr. W. Rushton Parker.*

**Austen (E. E.).** See **British Museum (Natural History).** Guide Books, etc. Economic Series, No. 1 a.

**Bacon (G. W.).** See **Atlases.** Popular Atlas of the British Isles.

**Baker (Richard. T.).** The Hardwoods of Australia and their Economics. 4to. *Sydney*, 1919. **Author.**

**Beddard (Frank Evers).** Mammalia. (The Cambridge Natural History.) Svo. 1909. *Dr. W. Rushton Parker.*

**Blanford (W. T.).** The Fauna of British India, including Ceylon and Burma. Svo. *London*, 1885-1921.

Mollusca, III.: Land Operculates. By **G. K. GUDE.**

**Bose (Sahay Ram).** Polyporaceæ of Bengal. (Bull. Carmichael Med. Coll., No. 1.) 4to. *Calcutta*, 1920. **Author.**

**Boulenger (George Albert).** See **British Museum (Natural History).** Reptiles: Monograph of the Lacertidæ.

**Bradley Bibliography.** See **Rehder (Alfred).**

**British Museum (Natural History).**

British Antarctic ('Terra Nova') Expedition, 1910.

Zoology. Vol. II. No. 9. Mollusca, Part III. Eupteropoda (Pteropoda Thecosomata) and Pterota (Pteropoda Gymnosomata). By **ANNE L. MASSY.**

No. 10. Mollusca, Part IV. Anatomy of Pelecypoda. By **R. H. BURSE.**

„ Vol. IV. No. 3. Echinoderma, Part II., and Euteropneusta. Larvæ of Echinoderma and Euteropneusta. By **E. W. MACBRIDE.**

### REPTILES.

Monograph of the Lacertidæ. By **GEORGE ALBERT BOULENGER.**  
4to. *London*, 1920.

### ARACHNIDA.

Studies on Acari. No. 1. The Genus *Demodex*, Owen. By **STANLEY HIRST.**  
4to. *London*, 1919.

### INSECTS.

#### *Dipterous Insects.*

A Handbook of British Mosquitoes. By **WILLIAM DICKSON LANGE.**  
4to. *London*, 1920.



*Lepidopterous Insects.*

Catalogue of the Lepidoptera Phalaenæ in the British Museum. Vol. II. Supplement. Catalogue of the Lithosiadæ (Arctianæ) and Phalaenoididæ. By Sir GEORGE F. HAMPSON. Text and Atlas. Svo. London, 1920.

## GUIDE-BOOKS, ETC.

Summary Guide to the Exhibition Galleries. Svo. London, 1920. Economic Series :

No. 1 a.—The House Fly. Its Life-History and practical Measures for its Suppression. By E. E. AUSTEN.

Svo. London, 1920.

No. 9.—Birds beneficial to Agriculture. By F. W. FRO-HAWK.

Svo. London, 1919.

No. 10.—Marine Boring Animals injurious to submerged Structures. By W. T. CALMAN.

Svo. London, 1919.

No. 11.—Furniture Beetles. Their Life-History and how to check or prevent the Damage caused by the Worm. By CHARLES J. GAHAN.

Svo. London, 1920.

Britton (Nathaniel Lord) and Millspaugh (Charles Frederick). The Bahama Flora.

Svo. New York, 1920.

Britton (N. L.) and Rose (J. N.) The Cactaceæ. Descriptions and Illustrations of Plants of the Cactus Family. Vols. I., II. 4to. Washington, 1919-20. Tagart Bequest.

Bull (Henry Graves). Notes on the Birds of Herefordshire.

Svo. London & Hereford, 1888. Rev. G. R. Bullock-Webster.

Butler (Samuel). See Atlases. An Atlas of Antient Geography.

Burne (R. H.). See British Museum (Natural History). 'Terra Nova' Expedition. Zoology, vol. ii. no. 10.

Carano (Enrico). Sulla particolare struttura delle radici tuberizzate di *Thrincia tuberosa*, DC. (Ann. Bot. i.)

Svo. Roma, 1903. C. C. Lacaita.

— Alene osservazioni sulla morfologia delle *Hypoxidaceæ*. (Ann. Bot. ii.)

Svo. Roma, 1904. C. C. Lacaita.

— Contribuzione alla conoscenza della morfologia e dello oviluppo del fascio vascolare delle foglie delle *Cicadaceæ*. (Ann. Bot. i.)

Svo. Roma, 1903. C. C. Lacaita.

— Su la struttura di stami anomali nel *Papaver Rhæus*, L. (Ann. Bot. ix.)

Svo. Roma, 1911. C. C. Lacaita.

— Su' l'origine e su la differenziazione dei tessuti nelle foglie. (Ann. Bot. ix.)

Svo. Roma, 1911. C. C. Lacaita.

— Ricerche sull' embriogenesi delle Asteracee. (Ann. Bot. xiii.)

Svo. Roma, 1915. C. C. Lacaita.

— Sull' embriologia di *Poinsettia pulcherrima*, R. Grah. (Ann. Bot. xiii.)

Svo. Roma, 1915. C. C. Lacaita.

Carpenter (G. D. Hale) A Naturalist on Lake Victoria. With an Account of Sleeping Sickness and the Tse-Tse Fly.

Svo. London [1920]. Author.

- Cash (James) and Wailes (George Herbert)**, assisted by JOHN HOPKINSON. *The British Freshwater Rhizopoda and Heliozoa. Vol. V. Heliozoa* (Ray Society). Svo. *London*, 1921.
- Cavara (Fridiano)**. *Sulla necessita della coltura di piante medicinali in Italia.* (R. Istituto d'Incor. Napoli, 1918.) 4to. *Napoli*, 1918. **C. C. Lacaita.**
- Clements (Frederic E.)**. *Plant Indicators. The Relation of Plant Communities to Process and Practice.* 4to. *Washington*, 1920.
- Cockayne (L.)**. *New Zealand Plants and their Story. Second Edition.* Svo. *Wellington, N.Z.*, 1919.
- Collinge (Walter E.)**. *The Necessity of State Action for the Protection of Wild Birds.* (Avicultural Mag. x.) Svo. 1919. **Author.**
- Cornish (C. J.)**. *The Living Animals of the World.* 2 vols. 4to. *London*, [?]. **Dr. W. Rushton Parker.**
- Dawe (M. F.)**. *Account of a Journey through the Western Portion of Colombia, showing the Possibilities of the Economic Development of the Districts visited.* 4to. *London*, [1919]. **Author.**
- De Wildeman (Emile)**. *Plantes nouvelles ou peu connues contenues dans l'Herbier de l'Herbarium Theuensis. Avec les descriptions ou annotations de M. Em. de Wildeman. Vols. I., II., livr. 1-3.* 4to. *Bruxelles*, 1904-1910.
- Dixon (H. N.)**. *Contributions to Antarctic Bryology.* (The Bryologist, xxiii.) Svo. 1920. **Author.**
- Dobie (Wm. Murray)**. *On the Cilia of Grantia.* (Goodsir's Ann. Physiol.) Svo. 1851. **Lister Institute.**
- Dragnewitsch (Pawla)**. *Spongien von Singapur.* Inaugural-Dissertation der Hohen philosophischen Fakultät der Universität Bern zur Erlangung der Doktorwürde. Svo. *Bern*, 1905. **Lister Institute.**
- Dymes (Thomas Alfred)**. *The Nature-Study of Plants. In Theory and Practice for the Hobby Botanist. With an Introduction by F. E. WEISS, F.R.S.* Svo. *London*, 1920. **Author.**
- East (Edward M.) and Jones (Donald F.)**. *Inbreeding and Outbreeding. Their Genetic and Sociological Significance.* Svo. *Philadelphia*, 1919.
- Engler (Adolf) and Gilg (Ernst)**. *Syllabus der Pflanzenfamilien. 8th Edition.* Svo. *Berlin*, 1919.
- Fiori (Adr.)**. *L'allevamento dei Pioppi dai semi e sua convenienza tecnica ed economica.* (L'Alpe (ii.) vi.) Svo. *Firenze*, 1919. **C. C. Lacaita.**
- Fitch (W. H.) and Smith (W. G.)**. *Illustrations of the British Flora. 4th Edition.* Svo. *London*, 1916. **Dr. W. Rushton Parker.**
- Fox (R. Hingston)**. *Dr. John Fothergill and his Friends.* Svo. *London*, 1919. **Author.**
- Fristedt (Konrad)**. *Sponges from the Atlantic and Arctic Oceans, and Behring Sea.* (Dvega-Exped. Vet. Iakt. Bd. iv. 1887.) Svo. *Stockholm*, 1887. **Lister Institute.**

- Gahan (Charles J.). See **British Museum (Natural History)**.  
Guide Books, etc. Economic Series. No. 11.
- Gilg (Ernst). See **Engler (Adolf)**.
- Gude (G. K.). See **Blanford (W. T.)**. The Fauna of British India, including Ceylon and Burma. Mollusca, III.
- Guppy (H. B.). Fossil Botany in the Western World. An Appreciation. (Amer. Journ. Sci. xlix.) Svo. 1920. Author.
- Harley (John). Contributions to Medical Science.  
Svo. 1864-1889. Author.
- Hirst (Stanley). See **British Museum (Natural History)**.  
Arachnida. Studies on Acari. No. 1.
- Johnston (Alex. Keith). See **Atlases**. School Atlas of Classical Geography.
- Johnston (Sir Harry). British Mammals.  
4to. London, 1903. Dr. W. Rushton Parker.
- Jones (Donald F.). See **East (Edward M.)**.
- Jourdain (Rev. F. C. R.). See **Mullens (W. H.)**.
- Keane (A. H.). The World's Peoples.  
Svo. New York, 1908. Dr. W. Rushton Parker.
- Kidd (Walter). Initiative in Evolution.  
Svo. London, 1920. Author.
- Kirkpatrick (R.). Descriptions of South African Sponges. I-III.  
Svo. Cape Town, 1902-3. Lister Institute.
- Lambe (Lawrence M.). Catalogue of the recent marine Sponges of Canada and Alaska. (Ottawa Nat. xiv.)  
Svo. 1900. Lister Institute.
- Description of a new Species of calcareous Sponge from Vancouver Island, B.C. (Ottawa Nat. xiii.)  
Svo. 1900. Lister Institute.
- Notes on Hudson Bay Sponges. (Ottawa Nat. xiii.)  
Svo. 1900. Lister Institute.
- A new recent marine Sponge (*Esperella bellabellensis*) from the Pacific Coast of Canada. (Ottawa Nat. xix.)  
Svo. [Ottawa, 1905]. Lister Institute.
- Lang (William Dickson). See **British Museum (Natural History)**. Insects (Dipterous). A Handbook of British Mosquitoes.
- Lankester (Sir Edwin Ray). Extinct Animals.  
Svo. 1909. Dr. W. Rushton Parker.
- Lendenfeld (Robert von). *Spinoseilla infundibulum*, n. sp.  
Svo. Altenburg, S.A., 1912. Lister Institute.
- Der Tierstamm der Spongien. Svo. Lister Institute.
- Lindman (C. A. M.). Svensk Fanerogamflora.  
Svo. Stockholm, 1918.
- Lydekker (R.). A Geographical History of Mammals.  
Svo. Cambridge, 1896. Dr. W. Rushton Parker.
- MacBride (E. W.). See **British Museum (Natural History)**.  
'Terra Nova' Expedition, Zoology, vol. iv. no. 3.
- Marindin (G. E.). A smaller Classical Dictionary of Biography, Mythology, and Geography.  
Svo. London, 1910. Dr. W. Rushton Parker.

- Massy (Anne L.).** See **British Museum (Natural History)**. 'Terra Nova' Expedition, Zoology, vol. ii. no. 9.
- Mattiroli (Oreste).** Contribuzione allo studio della *Monilia sitophilu* (Mont.) Sacc. (Atti R. Accad. Sci. Torino, lii.)  
Svo. *Torino*, 1918. **C. C. Lacaita.**
- I bulbi del *Muscari comosum* Mill. (Cipollaccio col. fiocco) proposti come alimento anche alle popolazioni dell' Italia settentrionale. (Ann. R. Accad. Agric. Torino, lxi.)  
Svo. *Torino*, 1918. **C. C. Lacaita.**
- Mayer (Alfred Goldsborough).** Medusæ of the World.  
Vol. I. } The Hydromedusæ.  
" II. }  
" III. } The Scyphomedusæ.  
4to. *Washington, D.C.*, 1910. **Tagart Bequest.**
- Metschnikoff (El.).** Beiträge zur Morphologie der Spongien.  
Svo. *Odessa*, 1876. **Lister Institute.**
- Millspaugh (Charles Frederick).** See **Britton (Nathaniel Lord)**.
- Morgan (Thomas Hunt).** The Physical Basis of Heredity.  
Svo. *Philadelphu & London*, [1919].
- Moss (Charles Edward).** Assisted by Specialists in certain Genera. The Cambridge British Flora; illustrated from Drawings by E. W. HUNNYBUN. Vol. III. Portulacaceæ to Fumariaceæ. (Text, pp. xvi, 200; Plates, pp. vi.)  
4to. *Cambridge*, 1920.
- Mullens (W. H.), Swaun (H. Kirke), and Jourdain (Rev. F. C. R.).** A Geographical Bibliography of British Ornithology from the Earliest Times to the End of 1918. Arranged under Counties.  
Svo. *London*, 1920.
- Murray's Handy Classical Maps.** Eleven.  
Svo. *London*, 1903. **Dr. W. Rushton Parker.**
- Paxton (Joseph).** Botanical Dictionary, comprising the Names, History, and Culture of all Plants known in Britain. New Edition by SAMUEL HEREMAN.  
Svo. *London*, 1868. **Dr. W. Rushton Parker.**
- Pearl (Raymond).** Sterilization of Degenerates and Criminals considered from the Standpoint of Genetics. (Eugenics Review, 1919.)  
Svo. **Author.**
- The Significance of some general Biologic Principles in Public Health Problems. (Journ. Amer. Med. Assoc. lxxiv.)  
Svo. *Chicago*, 1920. **Author.**
- Pelly (S. A.).** Glossary and Notes on Vertebrate Paleontology.  
Svo. *London*, (1918). **Dr. W. Rushton Parker.**
- Porter (Noah).** See **Webster (Noah)**.
- Pusa.** Report of the Proceedings of the Third Entomological Meeting held at Pusa on the 3rd to 15th February, 1919. In Three Volumes. Edited by T. BAINBRIGGE FLETCHER.  
Svo. *Calcutta*, 1920. **The Editor.**
- Ray Society.** Publications (continued).  
**CASH (JAMES) and WAILES (GEORGE HERBERT),** assisted by **JOHN HOPKINSON.** The British Freshwater Rhizopoda and Heliozoa. Vol. V. Heliozoa, by G. H. WAILES.  
Svo. 1921.

- Rehder (Alfred).** The Bradley Bibliography. A Guide to the Literature of the Woody Plants of the World published before the Beginning of the Twentieth Century. Vols. I.-V.  
4to. *Cambridge (Mass.)*, 1911-1918. Prof. C. S. Sargent.
- Rose (J. N.).** See Britton (N. L.).
- Saunders (Howard).** An illustrated Manual of British Birds.  
Svo. *London*, 1899. Dr. W. Rushton Parker.  
— A List of British Birds. Revised to July 1907.  
Svo. *London*, 1907. Dr. W. Rushton Parker.
- Scudder (Samuel Hubbard).** Index to the known Fossil Insects of the World.  
Svo. *Washington*, 1891.
- Shaw (George Russell).** The Genus *Pinus*. (Arnold Arboretum Pubs. No. 5.)  
4to. *Cambridge*, 1914.
- Skeat (Rev. Walter W.).** A concise Etymological Dictionary of the English Language.  
Svo. *Oxford*, 1887.  
Dr. W. Rushton Parker.
- Smith (William).** A Dictionary of Greek and Roman Biography and Mythology, by various Writers. 3 vols.  
Svo. *London*, 1873. Dr. W. Rushton Parker.  
— A Smaller Dictionary of Greek and Roman Antiquities.  
Svo. *London*, 1907. Dr. W. Rushton Parker.
- Spencer (Leonard J.).** The World's Minerals.  
Svo. *London*, 1911. Dr. W. Rushton Parker.
- Swann (H. Kirke).** See Mullens (W. H.).
- Swartschewsky (B.).** Materialui faunui gubok' chernago morya (Monaysnida). (Beitr. z. Kenntniss der Schwamm-Fauna des Schwarzen Meeres.)  
Svo. *Kiev*, 1905. Lister Institute.
- Tempère (J.).** Spicules d'Eponges.  
Svo. 1897.  
Lister Institute.
- Thomson (J. Arthur).** Outlines of Zoology.  
Svo. *Edinburgh, etc.*, 1914. Dr. W. Rushton Parker.
- Topsent (E.).** Sur une magnifique *Geodia megastrella* Carter du Muséum de la Rochelle.  
Svo. *La Rochelle*, 1911.  
Lister Institute.
- Urban (F.).** Zur Kenntniss der Biologie und Cytologie der Kalkschwämme (Familie Clathrinidæ, Minch.).  
Svo. *Leipzig*, 1910. Lister Institute.
- Walles (George Herbert).** See Cash (James).
- Weaver (John E.).** The Ecological Relations of Roots.  
4to. *Washington*, 1919.
- Webster (Noah).** International Dictionary of the English Language. Revised and enlarged by NOAH PORTER.  
4to. *London & Springfield, Mass.*, 1891.  
Dr. W. Rushton Parker.
- White (C. T.).** A rare and beautiful native *Tecoma*.  
Svo. Fred. Turner.
- Wight (Robert).** Icones Plantarum Indiæ Orientalis; or Figures of Indian Plants. 5 vols. (vol. 6 missing).  
4to. *Madras*, 1840-52. Sir Arthur Dorward.

- Wight (Robert).** Spicilegium Neilgherrense; or a Selection of  
Neilgherry Plants. 4to. *Madras*, 1846-51.  
*Sir Arthur Dorward.*
- Wilson (Ernest Henry).** The Cherries of Japan. (Arnold  
Arboretum Pubs. No. 7.) 8vo. *Cambridge*, 1916.
- The Conifers and Taxads of Japan. (Arnold Arboretum  
Pubs. No. 8.) 4to. *Cambridge*, 1916.
- Woods (Joseph).** Letters of an Architect from France, Italy, and  
Greece. Vols. I. and II. 4to. *London*, 1828.  
*Miss Elizabeth Wood.*
- Woodward (Horace B.).** Stanford's Geological Atlas of Great  
Britain and Ireland. 8vo. *London*, 1914.  
*Dr. W. Rushton Parker.*

## ABSTRACT.

Shetland Plants. By G. CLARIDGE DRUCE.

(See page 14.)

IN July and August of 1920 I visited the mainland and Unst in company with Prebendary the Rev. R. J. Burdon. The weather was not propitious, for we followed a spell of dry weather which hastened the flowering period, while the rain we met was too recent to have had much influence upon the vegetation. We had the advantage of having Mr. Beeby's notes, made on his numerous visits, and we can testify to the general accuracy of his painstaking and unwearied labours in this by no means easily explored district. I was able to add the following species to the flora:—*Cerastium subtetrandrum*, *Bursa Brittonii*, *Rhinanthus borealis*, *Potamogeton suecicus*, *P. rutilus*, and *Poa irrigata*.

*Senecio aquaticus* Huds. is common and differs from the southern form in its lesser stature, more conspicuous ligules, and its more compact inflorescence which, as Beeby says, forms an inverted pyramid. *S. Jacobæa* L. is practically absent, being limited to a small area of the coast near Scalloway, whereas *S. aquaticus* is frequent as a roadside weed, and is especially noticeable in fallow and derelict potato- or oat-fields, where from a distance it suggests *Chrysanthemum segetum*. (Dr. Druce suggested the name var. *ornatus* for the Shetland form.)

*Plantago*. On the wind-swept disintegrated serpentine hills to the north of Balta Sound grow many forms of *P. maritima* with *P. Coronopus* and variable *P. lanceolata*. One plant in particular belonging to the *maritima* section was quite striking from its conspicuous woody rootstock thickly beset with the persistent leaves of former years' growth; the leaves themselves crowded, broad, short, and very hairy with loose rather short shaggy hairs; the inflorescence short. This form is not, I think, represented in Beeby's gatherings; nor does it seem to be known from the Faroes. It may be in part what some botanists call *minor* Hook.; others would refer it to *hirsuta* Syme. Hooker founded his *minor* upon an Orkney plant described as having linear lanceolate leaves. Syme (Eng. Bot. vii. 172) changed the name to *hirsuta*, describing the leaves as linear-strap-shaped or semi-cylindrical. Such a form does occur both in Orkney and Shetland, but the form now described (for which Dr. Druce suggests the name *P. Edmonstoni*) has shorter broader leaves which recall those of *Echeveria*, often having a pruinose sheen. The *P. setacea* var. *lanosa* of Edmonston's Flora Shetl. a narrow-leaved plant in which the

leaf-bases have a tuft of white hairs, also occurs in both Orkney and Shetland as well as on the Scottish mainland. Plants with short broad hairy leaves also occur in Orkney, as at Hellie Hoy, but they are not so sturdy as that from Balta, which so far I have failed to match in herbaria. Cultivation and further study are necessary to determine whether it may be a distinct species, and also to eliminate the possibility of a hybrid parentage. *P. lanceolata* might afford the hairiness and broader leaves, but its root branching and leaf arrangement are quite different.

*Rhinanthus granulandicus* Chab. was found in both the known localities on a holm in Burga water, where it was discovered by Beeby (see Ann. Sc. Nat. Hist. 1907, 233), and on the cliffs at Saxavord. Ostenfeld reports it as frequent in the Faroes and clearly distinguishable from *R. minor*, being allied to *R. borealis* and *R. Drummond-Haji*.

*Potamogeton suecicus* (Richt.). One of the special objects of my northern visit was to clear up the question of the recorded occurrence of *P. vaginatus* Turcz., to which Bennett had referred the specimens gathered by Beeby in the Lochs of Asta and Tingwall. My examination of Beeby's herbarium led me to doubt the accuracy of this identification, which has been subsequently questioned by Hågstrom (Crit. Research. Pondweeds). We paid three visits to these lochs, which lie in an interesting valley about six miles from Lerwick, but were only able to collect barren specimens of plants which seem identical with those obtained by Beeby. Hågstrom unhesitatingly rejected these from *P. vaginatus* and refers them to *P. suecicus* Richt., a hybrid between *P. pectinatus* and *filiiformis*, as var. *intermedius* forma *pectinatoides* Hågstr. *P. vaginatus* Turcz. may therefore disappear from our list.

*P. rutilus* Wolfg., hitherto only known with certainty from Lyn Coron, Angelsea, we found growing plentifully in the Lochs of Tingwall and Asta, and also in the Loch of Bardister at Walls.

A short time was spent in the Orkneys, where we had the advantage of the company of Colonel H. Halero Johnston, F.L.S. This resulted in adding two species to the Scottish flora—a *Nitella*, identified by Mr. James Groves as *N. nidifica* Ag., which we dredged up in the Loch of Stenness, and previously only recorded from an aged specimen too poor for figuring, found by the Rev. E. S. Marshall in 1896' in a lagoon north of Wexford Harbour, and *Chara caulescens* which was growing with it, and hitherto known only from the south of England and Wexford.



## NOTICE.

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THE collection of portraits of Naturalists recently added to and rearranged by Dr. W. Rushton Parker, can be readily consulted as it is housed in a cabinet in the Council Room.

The Linnean portraits form a collection distinct from the foregoing, but can be easily inspected.

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- Goiffon, P., deceased, 24.
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- Voeleker, J. A., withdrawn, 24.
- Waddington, H. J., withdrawn, 24.
- Wales, G. H., withdrawn, 24.
- Walker, A. O., exhibited *Papaver umbrosum*, hort., showing carpellody of the stamens, 62.
- Walsh, E. H. C., Lhasa and Central Tibet, 7.
- Walsh, Lt.-Col. J. H. T., Councillor retired, 25; on certain Flagellates, 9.
- Watts, Rev. W. W., deceased, 24.
- Webb, W. M., exhibited rare woodlouse, *Ligidium hypnorum*, 62.
- White, J. W., elected, 62; proposed, 19; sec. reading, 20.
- Whyte, Rev. A., deceased, 24.
- Wibberley, Prof. T., elected, 62; proposed, 20; sec. reading, 22.
- Wiesner, Prof. J. von, obituary, 59.
- Willis, Dr. J. C., Endemic genera in relation to others, 3.
- Wistman's Wood (Christy), 9.
- Withdrawals, 24.
- Wollaston Expedition Mosses, *see* Dixon, H. N.
- Wolley-Dod, Lt.-Col. A., elected, 5; sec. reading, 2.
- Woodlouse rare in Britain exhibited (Webb), 62.
- Woodward, Dr. A. Smith, elected President & Councillor, 25.
- Wortley, E. J., elected, 22; proposed, 5; sec. reading, 6.
- Yoshida, Dr. S., admitted, 19; proposed, 6; sec. reading, 8.
- Zoological Secretary (Prof. E. S. Goodrich), elected, 25.

PROCEEDINGS

OF THE

LINNEAN SOCIETY OF LONDON.



134TH SESSION.

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FROM NOVEMBER 1921 TO JUNE 1922

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List of [Fellows, Associates, and Foreign Members], Nov. 1921.



# PROCEEDINGS

OF THE

## LINNEAN SOCIETY OF LONDON.

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(ONE HUNDRED AND THIRTY-FOURTH SESSION,  
1921-1922.)

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November 3rd, 1921.

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 16th June, 1921, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Mr. William Edward Hollows was admitted a Fellow.

A certificate in favour of Miss Kathleen Bever Blackburn, M.Sc.(Lond.), was read for the second time.

The following were proposed as Fellows:—

Hugh Fraser Macmillan; Frederick Albert Mitchell-Hedges; Willis Openshaw Howarth, M.Sc.; Benjamin Millard Griffiths, M.Sc.(Birm.); Miss Margaret Collins, B.Sc.(Syd.); Robert Gurney, M.A.; Miss Flora Amelia Gordon; Prof. George Matthai, M.A.(Cantab.); Prof. Edward Hindle, M.A., Ph.D., A.R.C.S.; Herbert Bennett Williamson; Frederick Berry-Lewis Butler; Miss Isabel Soar, Ph.D.(Lond.); Frank Howard Lancum, F.Z.S.; Clive Errol Lord; and Sydney Garside, M.Sc.

Miss Matilda Smith was elected an Associate.

The President announced that there were four vacancies in the List of Fellows, and that a Ballot would be taken to fill those vacancies on the 17th November.

A statement was made from the Chair, announcing the installation of an electric exhaust-fan to aid in the better ventilation of the Meeting Room, and that a new boiler for central heating was in position, and would be available in a few days.

The first exhibition was by Dr. P. TH. JUSTESEN, of photographs of *Rafflesia Arnoldi* taken in Sumatra in 1920. (Communicated by Sir Daniel Morris, K.C.M.G.) The lantern-slides were explained by Dr. A. B. Rendle, F.R.S., Sec.L.S., who also showed the plates illustrating Robert Brown's classical memoir in the 13th volume of the Society's Transactions, a century ago. Mr. H. N. RIDLEY mentioned that he had never seen a flower a yard in diameter as usually quoted, nor of *R. Hasseltii*; as usually met with sporadically in the forest, they were about 18 inches across. The plant is parasitic on vines (*Cissus*); the flower opens early and has a rather faint carrion smell for an hour or two. The Malays call it "Kurubut," almost the same name as they give to *Thottea grandiflora*; it is collected and sold as an astringent.

Dr. A. B. RENDLE showed specimens, bearing fruit, of a hybrid between the sweet orange *Citrus Aurantium* var. *sinensis* and *C. trifoliata*, the wild orange of China and Japan, which had been sent by Mr. Richard H. Beamish, F.L.S., from his garden at Glounthane, Co. Cork. The hybrids between these species are known as Citrange, and have been made with a view to impart the greater hardiness of *C. trifoliata* to the sweet orange. The hybrid shows transitions between the unifoliate leaf of the sweet orange and the trifoliate leaf of the other species; it is evergreen like the sweet orange while *C. trifoliata* has deciduous leaves. The fruit, which is larger than in *C. trifoliata*, has a soft hairiness recalling the hairy character of the fruit of that species. Mr. C. LACAITA added a few remarks.

The General Secretary then gave an account of the recently-completed Catalogue of the Linnean Herbarium. He stated that his first reference to the Herbarium was made nearly 50 years ago, when he found that Mr. R. Kippist, at that time Librarian, could not explain certain signs employed by Linnæus, the meaning of which had been lost. The speaker's first published contribution to a knowledge of the herbarium was made in 1888, upon the Centenary Anniversary of the Society, when he was commissioned by the President, Mr. W. CAREWTERS, F.R.S., to draw up an account of the growth of the collections, their purchase by Dr. J. E. Smith, and lastly, their acquisition and tenure by the Society. In turn followed an account of the Banksian desiderata supplied from the Linnean stores; the List of the genera with the number of sheets in each, and the Index issued in 1913. A diversion to the zoological collections came to publication in the next year; then Tulbagh's considerable collection in 1918, and finally the present MS. which had taken more than two years to compile. The guiding idea has been to supply the answer to future enquiries

such as "Who wrote that?" by giving the writer's name to each label or comment, wherever possible, the Linnean letters affording an invaluable help to identifying handwriting. The MS. has been drawn up for reference in after years; it includes the interpretation of many signs used by Linnæus, the meaning of which had been lost for more than a century, but was now rediscovered. Lantern-slides in explanation of these points were shown. (See Supplement.)

Mr. JAMES GROVES presented a paper on Charophyta collected by Mr. THOMAS B. BLOW in Ceylon. He prefaced his remarks by referring to the great services Mr. Blow had rendered in making large collections of these plants in the course of travels in many parts of the world; and to the great beauty and excellence of the specimens, some of which were exhibited, due to Mr. Blow's care and attention in floating them out, in spite of the work having often to be done under very difficult conditions.

Mr. BLOW gave some particulars of the districts visited on each occasion, and of the means of transit, much of which had to be accomplished over rough roads by bullock-cart at a very slow pace, and stated that many of the specimens were obtained from tanks which had been in use when large tracts of country, which are now lying waste, were in cultivation.

Miss HILDA M. COLEY showed thirty drawings of succulent plants from the collection of Mr. W. C. G. Ludford, of Four Oaks, Birmingham, chiefly of *Phyllocactus*, *Cereus*, *Echinocactus*, and *Mamillaria*, with certain Cape plants as *Aloc*, *Gasteria*, *Haworthia*, and *Crassula*.

Dr. A. B. Rendle commented on these admirable drawings.

November 17th, 1921.

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 3rd November, 1921, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Certificates for the following were read for the second time:—

Hugh Fraser Macmillan; Frederick Albert Mitchell-Hedges; Willis Openshaw Howarth, M.Sc.; Benjamin Millard Griffiths, M.Sc.(Birm.); Miss Margaret Collins, B.Sc.(Syd.); Robert Gurney, M.A.; Miss Flora Amelia Gordon; Prof. George Matthai, M.A.(Cantab.); Prof. Edward Hindle, M.A., Ph.D., A.R.C.S.; Herbert Bennett Williamson; Frederick Berry-Lewis Butler; Miss Isabel Soar, Ph.D.(Lond.); Frank Howard Lancum, F.Z.S.; Clive Errol Lord; and Sydney Garside, M.Sc.

Norman Douglas Simpson, B.A.(Cantab.), and Douglas Miller Reid were proposed as Fellows.

The following were elected Fellows by ballot:—

Prof. Walter Garstang, M.A., D.Sc.(Oxon.); Walter Sidney Stevens; Miss Winifred Mary Ailsa Lomas, B.Sc.; and William Rae Sherriffs, M.A., B.Sc.(Aberd.).

The President remarked upon a representation of a section of Derbyshire from East to West, executed in samples of the respective rocks by Mr. White Watson, who was elected a Fellow in 1795 and whose death was reported at the Anniversary Meeting of 1837. He was connected with the Post Office and the dispatch of the mails, and in 1794 he prepared the representation above mentioned, issuing also a pamphlet descriptive of it. The British Museum (Natural History) possesses the pamphlet but not the tablet here shown, which measures 19" by 13". As the tablet is somewhat remote from the pursuits of the Linnean Society, the Council has suggested that it would be appropriate to transfer the tablet to the Trustees of the British Museum. It was given to the Society on the 24th May, 1810.

On a show of hands this suggestion was adopted.

The President exhibited a newly-discovered human skull from the Rhodesia Broken Hill Exploration Company's mine in N.W. Rhodesia. It evidently belonged to an extinct race of cave-men, with a skull much resembling that of the European cave-men of the Neanderthal race, but with an erect skeleton.

Prof. E. S. GOODRICH, F.R.S., Sec.L.S., proposed a vote of thanks to the President for this exhibition, the first made before any scientific society; this was accorded by acclamation.

Capt. A. W. HILL, F.R.S., then gave an account of his recent official visit to the Cameroons and Nigeria. He described the settlement of Victoria and gave its history, passing to the Botanic Garden there, having an area of 200 acres, with laboratory, herbarium, and museum buildings, now awaiting restoration to their proper function. The site is admirable, and the soil good; connected with this garden are the experimental plots of tea and cinchona at Buea, at an altitude of 3300–3600 feet on the Cameroon Mountain.

The lecturer then sketched his journey in Nigeria and his visit to the Bauchi Plateau, Northern Provinces, where he had the good fortune to enlist the services of Mr. H. V. Lely, the Forestry Officer of the district, and others for collecting specimens of the local flora. Over 600 specimens have already been received at Kew from Mr. Lely, and so far as they have been determined show a large proportion of new species. The flora of the plateau shows interesting affinities with the flora of Abyssinia and Nyasaland.

The lecture was illustrated by a large series of lantern-slides.

Dr. Stapf, F.R.S., and Dr. Rendle, F.R.S., Sec.L.S., contributed further remarks, and Captain Hill briefly replied.

December 1st, 1921.

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 17th November, 1921, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Certificates for the following were read for the second time :—  
Norman Douglas Simpson, B.A.(Cantab.), and Douglas Miller Reid.

Mrs. Alice Sophia Bacon, B.Sc.(Lond.), was proposed as a Fellow.

The President gave notice of a proposed change in the Bye-Laws, enlarging the permissible number of Fellows from 710 to 800.

It was also announced from the Chair that a Dinner would take place after the meeting of the Society on 19th January, 1922.

The first communication was by Prof. W. NELSON JONES, M.A., entitled "Notes on the Occurrence of *Brachiomonas*" (see Abstract, pp. 57-59).

Sir N. Yermoloff, K.C.B., Dr. E. J. Salisbury, Dr. W. T. Calman, and Mr. H. N. Dixon contributed further remarks, and the author briefly replied.

Mr. J. BURTT-DAVY then gave an account of the distribution of *Salix* in South Africa. He remarked that confusion of species in this region was partly due to the dimorphism of the leaves, those of young shoots being often quite different from the adult leaves. We can recognise in South Africa ten possible species or varieties, and in tropical Africa twelve named species, only one being common to both areas, a form characteristic of the Limpopo River basin, but not crossing the Zambezi; the other nine are strictly endemic, mostly in very limited areas, so that cross-pollination is practically impossible. Usually each species is confined to one particular drainage-basin; where more than one species is found in the same basin, it is due to erosion, the streams being formerly united. Thus the distribution of *S. Woodii* and *S. garipeina* suggest a coast origin and subsequent ascent to the mountains following the erosion of the streams; had it originated on the Drakensberg, the two could hardly have failed to reach the same drainage-basin, as they now occur only fifty miles apart. *S. Woodii* may be the connecting-link by way of

Pondoland, the Transkei, and Eastern Cape with *S. Safsaf* in Rhodesia. Although the Orange River is now isolated from Angola by the wastes of the Kalahari, it is possible that these three species, or a common ancestor, came down from the north during the time when the Cunene discharged into the Orange River by way of the Molopo. A form of *S. Safsaf*, called *S. huillensis*, Seemen, is found on tributaries of the Cunene River.

A discussion followed, in which the President, Dr. Rendle, and Mr. E. G. Baker took part, the author replying.

The last paper was by Mr. MILLER CHRISTY, "The Problem of the Pollination of our British Primulas."

A discussion by Dr. D. H. Scott, Mr. C. C. Lacaita, Mr. T. A. Dymes, Mr. J. Burt-Davy, and Mr. H. R. Darlington followed, and the author replied.

December 15th, 1921.

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 1st December, 1921, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

A special vote of thanks was passed to Dr. W. RUSHTON PARKER, F.L.S., for his gift of the 'Encyclopædia Britannica,' 11th edition.

A certificate in favour of Mrs. Alice Sophia Bacon, B.Sc. (Lond.), was read for the second time.

The following were proposed as Fellows:—Miss Edith Philip Smith, B.A. (Oxon.), and Miss Elaine Mary Rees, B.Sc. (Lond.).

The President read for a second time the proposed change in the Bye-Laws, Ch. I. § 1, enlarging the number from 710 to 800 Fellows.

It was also announced from the Chair that Ballots would be taken for Fellows on the 19th January and 2nd February, 1922.

The first communication was by Capt. F. A. PORTS, M.A., on the work of the Carnegie Institution in the Marine Biology of Samoa. Photographs of the Island of Tutuila, with its wooded cliffs and enveloping coral-reefs, were shown, and descriptions given of the fish fauna, with illustrations taken under water by officials of the Institution.

The discussion was opened by the President, followed by Dr. G. P. Bidder and Prof. E. S. Goodrich, F.R.S., Sec.L.S., the author replying.

The second communication was a paper by Prof. G. C. BOURNE, F.R.S., on "The Raninidæ, a Study in Carcinology"; and in the absence of the author, was read by Prof. E. S. Goodrich in abstract.

Dr. W. T. Cahman, F.R.S., contributed a few further remarks.

January 19th, 1922.

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 15th December, 1921, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Khubchand Isardas Thadani, B.Agr. (Bomb.), M.Sc. (Texas), was proposed as a Fellow.

Certificates in favour of the following were read for the second time:—Miss Edith Philip Smith, B.A. (Oxon.), and Miss Elaine Mary Rees, B.Sc. (Lond.).

The following were elected Fellows:—

Murray Ross Henderson; Miss Kathleen Bever Blackburn, M.Sc. (Lond.); Frederick Albert Mitchell-Hedges, F.R.G.S.; Willis Openshaw Howarth, M.Sc.; and Benjamin Millard Griffiths, M.Sc. (Birm.).

The proposed alteration in Ch. I. § 1 of the Bye-Laws increasing the maximum number of Fellows from 710 to 800 was put to the ballot and carried. The said section now runs as follows:—

Chap. I. Section 1. The number of Fellows shall be limited to *Eight* hundred, exclusive of Honorary Members, Foreign Members, and Associates. The method of Election shall be by Ballot.

The President announced that on the 2nd and 16th of March, 1922, Ballots for Fellows would take place.

Dr. A. B. RENDLE, F.R.S., Sec.L.S., showed a piece of the wood of *Orites excelsa*, R. Br. (family Proteaceæ), one of the Australian Silky Oaks, sent by Mr. T. Steel, of Sydney, N.S.W. The tree, which is a native of northern New South Wales and Queensland, is of unique interest from the deposits of aluminium succinate which occurs in cavities of the wood. Aluminium is very rarely

found in flowering plants and only in small trees; but *Orites excelsa* absorbs alumina from the soil in large quantities, as shown by analysis of the ash. Occasionally the amount taken up is excessive, in which case the excess is deposited in cavities as a basic aluminium succinate.

In reply to Sir Sidney Harmer, F.R.S., Dr. Rendle stated that this deposit was characteristic of all specimens of this species.

Dr. E. MARION DELF gave an account of research on *Macrocystis* by Miss M. M. MICHELL and herself. After describing the distribution of the alga, the authors reviewed recent accounts of it, and showed lantern-slides in explanation.

The fertile fronds are completely submerged, smooth, dichotomously branched, and usually borne on special shoots. They bear sori on both sides of the frond. Exceptional cases were described of discontinuous sori occurring in the grooves of fronds with wrinkled surface and borne on the long swimming shoots, and usually without a swim bladder at the base.

The zoospores do not appear to have been previously described. Material brought from the shore in the morning, and examined in the laboratory in the evening, showed swarming zoospores; the next morning swimming actively, and more slowly.

Cultures were made from the material in the following way:—About two hours after gathering, the alga was placed in a covered glass dish, with a few cover-slips at the bottom, and then seawater was added. The piece was removed the next day, and 10 days later all the zoospores had come to rest, but showing no sign of germination. Five weeks afterwards short filaments of two different sizes were observed, comparable with the male and female gametophytes in Laminariaceæ reported by Sauvageau and Lloyd Williams. Two months later young stages of the sporophyte were visible on the cover-glasses, a thick-walled empty cell always being at the base of the sporophyte, probably the empty oogonial wall after the escape of the oospore. No sign of the antheridial cells had been noticed. The discovery of the filaments developed from the zoospores and the subsequent growth of the sporophytes from filaments bring it into line with other members of the same family.

The authors consider that the species occurring at the Cape is *Macrocystis angustifolia*, Bory, from its rhizome-like attachments.

A discussion followed, the participants being Miss A. L. Smith, Sir W. A. Herdman, Dr. R. R. Gates, Mr. A. D. Cotton, and Mr. J. Burt-Davy, Dr. E. M. Delf replying.

The next paper was by Mr. J. L. CHAWORTH MUSTERS, entitled "The Flora of Jan Mayen Island," with lantern-slides (communicated by Dr. W. Rushton Parker, F.L.S.).

The flora of Jan Mayen may be divided into four main groups: the floras of the sea-shore, of the bird-cliffs, of sheltered places in the "tundra," and the mountain flora. The most luxuriant



flora, which consists of *Taraxacum* or *Oxyria*, grows either under the bird-cliffs or in places where tuff has been reassorted by water. The limit of flowering plants seems to be about 3000 feet. The total phanerogamic vegetation consists of about 43 species, all of which are common to both Norway and East Greenland. The origin of the flora presents a very complicated problem. Seeds have probably been brought there on the feet of wading birds which migrate to and from their breeding-grounds in East Greenland. It is highly improbable that Jan Mayen has ever been connected with either Iceland or Greenland. Many plants have probably reached Jan Mayen during recent years.

Mr. Frits Johanssen (visitor) and Mr. A. J. Wilmott added further remarks, to which Mr. Musters replied.

February 2nd, 1922.

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 19th January, 1922, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Dr. William Rae Sherriffs, M.A.(Aberd.), was admitted a Fellow.

The following were proposed as Fellows:—Reginald Cory, Hugh Vandevaes Lely, B.Sc. (Edin.), and Prof. Surendra Chandra Banerji, M.A., B.Sc. (Calc.).

The certificate in favour of Khubchand Isardas Thadani, B.Agr. (Bomb.), M.Sc. (Texas), was read for the second time.

The following were elected Fellows:—Lekshminarayanapuram Subramania Subramaniam, and Hugh Fraser Macmillan.

Mr. FRITS JOHANSSEN then gave an account of the Canadian Arctic Expedition (1913–18), of which he was a member, which started from Vancouver in the 'Karluk' to Nome in Alaska, where local requisites as skins, dogs, and native attendants were procured, and the expedition divided into two parties, the northern and southern. The former under Mr. Stefansson became frozen in on board the 'Karluk' in September, was carried westward, until she was crushed in the ice and sank, in about 73° N. Lat. and 160°–165° W. Long. The party took necessaries from the ship and camped on an ice-floe. In attempting to reach land in February 1914, five sailors and three of the scientific staff lost their lives; the party in March reached Siberia, finally reaching Nome in May. The relief ship relieved the party and

brought the scientific collections to Esquimault in October. Stefansson organised a new search-party after this, by sledge across Banks Land, and later explored Parry Islands, discovering coal in Melville Island. The entire party wintered on Barter Island, 1916-17; further investigations followed, and the expedition reached Nome in August, 1917.

The results were surveys of coasts hitherto unmapped, much geologic material gathered, many fossils, implements used by Esquimaux, with specimens of zoology and botany in quantity; these records are now in course of publication. A series of lantern-slides closed the communication.

The next communication was "Some Statistics of Evolution and Geographical Distribution in Plants and Animals and their Significance," by J. C. WILLIS, M.A., Sc.D., F.R.S., and G. UDNX YULE, C.B.E., M.A., F.R.S.

At the Meeting of the Society on 18th November, 1920, there were shown four closely parallel curves illustrating the percentages of genera belonging to families in order of size, taking the same groups of (10) families for the world, and for various sections of it, including finally the whole of the islands, to which there were 1552 genera confined. These curves are shown in the 'Annals of Botany,' xxxv. (1921) p. 510, and illustrate clearly what may be termed the "hollow curve" of distribution, or curve concave on upper side. The appearance of the curve obtained by plotting series of numbers like this is something as if one had taken a strong steel spring and tried to double it into the angle of a brick wall.

This "hollow curve pattern" of distribution was first noticed in 1912, in the flora of Ceylon, when working it up for the first paper on "Age and Area." It reappeared in 1916 in the curve of distribution of the endemics of New Zealand, which showed a very large proportion of the species in the class which included only those of extremely limited area, with a rapid tapering off to the large areas. It showed still more clearly in the endemics of the Hawaiian Islands, where 47 per cent. of the species occurred on one island only, and 20 per cent. on two (there are 7 chief islands). It came out with complete regularity in every case of distribution that was investigated, whether of endemic species or of non-endemic.

At the same time, investigation of areas showed clearly that, besides "Age and Area," the twin principle which may be called "Size and Space" was also valid.

The hollow curve seems to be an almost universal feature, not only of the geographical distribution, but of the evolution, of plants and animals. The form of the distribution for sizes of genera might be such that the logarithm of the number of genera plotted to the logarithm of the number of species would give a straight line. This law is found to hold fairly closely up to genera of 30-40 species.

The next step was taken when the 1582 endemic genera of islands were divided among their respective islands, when it was found that the sizes of the genera, for *every* island, varied from very many monotypes, through a good many ditypes, to a tail of a few larger genera. On the larger islands, such as Madagascar, this phenomenon was even shown by the individual families.

The general result seems to be to show that evolution and geographical distribution have proceeded in a chiefly mechanical way, the effects of the various "other" factors that intervene—climatic, ecological, geological, etc.—being only to bring about deviations this way and that from the dominant plan. Every family and every genus, and in every country, behaves in the same way. Strong evidence is thus given for De Vries's theory of Mutation, and for Guppy's theory of Differentiation.

Mrs. E. M. REID then followed with her "Note on the Hollow Curve as shown by Pliocene Floras." The material was that published from Tegelen, Castle Eden, etc., the author concluding that fossil floras take their appropriate place alongside living floras, bringing direct evidence from the host to show the universality of the law of Hollow Curve Distribution.

A discussion on these two papers followed, in which the President, Dr. D. H. Scott, Dr. E. J. Salisbury, Prof. R. R. Gates, and Mr. A. J. Willmott took part, Dr. Willis replying.

February 16th, 1922.

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 2nd February, 1922, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Surendra Nath Bal, Ph.C., M.Sc. (Mich., U.S.A.), was proposed as a Fellow.

Certificates in favour of the following were read for the second time:—Reginald Cory, Hugh Vaudevaes Lely, B.Sc. (Edin.), and Prof. Surendra Chandra Banerji, M.A., B.Sc. (Calc.).

The President announced four vacancies in the list of Foreign Members, occasioned by the deaths of Prof. Otto Bütschli, Prof. Edmond Perrier, Prof. Georg Klebs, and Prof. Johann Wilhelm Spengel.

Prof. R. R. GATES then introduced his paper on "The Inheritance of Flower Size in Plants." He stated that reciprocal crosses were made at Merton in 1912 between *Oenothera rubricalyx* and *O. biennis*, the former having petals about 40 mm. in length and the latter about 20 mm. in length. The size of flowers in  $F_1$  was intermediate and relatively uniform. In  $F_2$  there was a marked difference in size of flowers, (1) on different plants, (2) in different flowers of the same plant, and (3) sometimes even in the different petals of a flower. More extensive measurements were made on  $F_2$  and  $F_4$  plants. The results show that the hypothesis of several Mendelian factors for length of petal is an insufficient explanation. Variation curves show a tendency to segregation in flower-size between different plants, but also a tendency for the occurrence of smaller flowers, some of the smallest petals being only 7 mm. in length. The disorderly nature of the variation, and the fact that the petals of one flower may be of different lengths, shows that this segregation is not confined to cell-formation, and is not Mendelian. Probably cytoplasmic differences are involved in this type of inheritance and variation.

The communication was followed by a lantern-demonstration and a discussion, in which Lt.-Col. J. H. Tull Walsh and Dr. A. B. Rendle took part, the author replying.

Capt. J. RAMSBOTTOM exhibited a couple of the brilliant golden beetles, *Aspidomorpha sanctæ-crucis*, from Bombay Harbour.

Mr. WILLIAM DALLIMORE, of the Royal Botanic Gardens, Kew, then introduced the subject of the effect produced by wind at Llandudno in causing remarkable dwarfing of trees and shrubs growing on the exposed rocks of the Great Orme's Head, illustrating his remarks by actual specimens and lantern-slides.

A discussion followed, in which the President, Mr. Gerald W. E. Loder, and Mr. Lacaita took part, the author replying.

Mr. J. L. NORTH, of the Royal Botanic Gardens, Regent's Park, then spoke of the possible successful growth of *Glycine Soja*, Sieb. & Zucc., as a profitable crop in this country. He said:—The plants I have upon the table are English-grown specimens of the Soya bean, from a plot at Chiswick in 1921. They are far finer than anything I have seen or grown. Apart from its cultural and commercial importance, the plant has certain characteristics which are the results of Chinese methods of cultivation, and these I should like to point out. One is the peculiar flattening of the branches, the result of close sowing—a method to which the plant has become so accustomed that even when grown wide apart it still retains the habit. Another peculiarity is the fact that if it starts at a wrong angle it twists itself upon its base to bring it into line with the others; this is well illustrated in some of the plants.

I have been experimenting with this variety of Soya since 1913, when I obtained a few seeds of a so-called German

acclimatized plant. Each year since I have worked with the earliest ripening seeds of the previous year, experimenting and testing them in many places, but always with the one idea of hastening the crop—as being the only chance of making it grow in this country. In this I have succeeded to some extent, for whereas my first plants in 1914 did not ripen until November 28th, this last year they had reached a corresponding degree of ripeness early in September—a difference of two months.

Mr. H. R. DARLINGTON asked what was the percentage of oil. The lecturer replied that the percentage of oil was 18 to 21; and then proceeded to give the use to which the Bean was put, which account was supplemented by Mr. H. N. RIDLEY, who mentioned the Soy and “Bean Cheese” of the East, and remarked that the plant flourished best in a dry climate rather than a moist one. He also detailed the fermentation of the bean into commercial soy.

March 2nd, 1922.

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 16th February, 1922, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Mr. Rowland Maurice Richards, M.B.E., A.R.C.S., was admitted a Fellow.

Prof. Lucien Cuénot, Nancy; Prof. Gustave Gilson, Brussels; Prof. Jakob Wilhelm Ebbe Gustav Leche, Stockholm; and Dr. Benjamin Lincoln Robinson, Harvard, were proposed as Foreign Members.

The certificate in favour of Surendra Nath Bal, Ph.C., M.Sc. (Mich., U.S.A.), was read for the second time.

The following candidates were elected by ballot:—

Miss Margaret Collins; Robert Gurney; Miss Flora Amelia Gordon; Prof. George Matthai, M.A. (Cantab.); Prof. Edward Hindle, M.A., Ph.D.; Herbert Bennett Williamson; Frederick Berry-Lewis Butler; Miss Isabel Soar, Ph.D. (Lond.); Frank Howard Lancum, F.Z.S., F.E.S.; and Clive Errol Lord.

Mr. H. N. DIXON exhibited a specimen of Burmese Amber, with a moss included in it, probably a species of *Hypnodendron*, C. Muell.

Mr. R. E. HOLTTUM spoke of the Flora of Greenland, illustrating his remarks with a series of lantern-slides; an abstract of his remarks, supplied by the author, is appended:—

The writer accompanied Professor A. C. Seward during the summer of 1921 on a visit to Disko Island and the neighbouring parts of the west coast of Greenland. The lantern-slides exhibited are from photographs taken on that expedition, and illustrate some of the vegetation types observed. The most widely-spread vegetation consists of a low heath, the most important species being *Empetrum nigrum*, *Cassiope tetragona*, and other ericaceous plants. In specially protected localities a scrub of *Salix glauca* may be found, which may reach eight feet in height, and accompanying this a luxuriant vegetation of herbaceous plants of southern type. In unfavourable situations the ground is not covered by the vegetation, which consists of isolated plants of resistant herbaceous and woody species. The total flora of the whole of Greenland consists of 416 species of vascular plants, of which 18 per cent. are high arctic in type, 22 per cent. widely distributed, and 60 per cent. of southern type. The problem of the means of arrival of the last-named group after the Glacial period is an interesting one.

Mr. JOHN WALTON followed with remarks on the ecology of the flora of Spitzbergen, as shown in his abstract, which follows:—

From the point of view of numbers of species, the richest flora in Spitzbergen occurs in those places where the nearest approach to Continental conditions is found. Blytt pointed out that arctic plants tend to avoid an oceanic climate. The head of Klaas Billen Bay, one of the branches of the fiord, is situated near the centre of West Spitzbergen, and is included in a small elliptical area of about 5000 sq. kilometres, which Nathorst has shown to contain 90 per cent. of the species of vascular plants occurring in Spitzbergen. The area around Bruce City, at the head of Klaas Billen Bay, can be divided roughly into three vegetational zones:— Raised Shingle Beach, Alluvial Land between mountain and beach, and Scree Slopes. The land is rising relatively fast from the sea, and the development of the flora of Alluvial Land and Raised Shingle Beach can be traced from initial stages in an intertidal zone. This intertidal zone shows many points of resemblance to the salt-marsh formation of lower latitudes.

Prof. A. C. SEWARD, F.R.S., who communicated both papers, opened the discussion by remarking that his main object was the collection of fossil plants. He recommended Greenland as a summer resort, the only difficulty being getting there; and referred to Dr. Porsild's work in establishing a scientific station within the Arctic Circle.

The President, Mr. E. G. Baker, Dr. J. R. Leeson, Mr. C. E. Salmon, Mr. J. Burt-Davy, Mr. T. A. Sprague, Mr. T. A. Dymes, and Prof. F. E. Weiss, F.R.S., joined in the discussion, and the authors replied.

Sir W. A. HERDMAN, C.B.E., F.R.S., followed with his "Spolia Rumiana, V.—Summary of Results of Investigation of the Plankton of the Irish Sea during fifteen years."

Sir Nicolas Yermoloff, K.C.B., Mr. W. S. Rowntree, and Mr. C. C. Lacaíta joined in a discussion, the author replying.

March 16th, 1922.

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 2nd March, 1922, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

The President announced that the Council had fixed the dates of 4th May and 1st June for ballots.

It was also announced from the Chair that, as an experiment, the Library (only) will remain open till 9.0 P.M. after the four remaining General Meetings of the present Session.

Mr. William Narramore, Mr. Frank Howard Lanum, Miss Isabel Soar, Ph.D., and Mr. William Williamson were admitted Fellows.

George Valentine Chapman Last was proposed as a Fellow.

The certificates in favour of the four naturalists proposed as Foreign Members on the 2nd March were read for the second time.

The following were severally balloted for and elected Fellows:—

Sydney Garside, M.Sc.; Norman Douglas Simpson, B.A. (Cantab.); Douglas Miller Reid; Mrs. Alice Sophia Bacon, B.Sc. (Lond.); Miss Edith Philip Smith, B.A. (Oxon.); Miss Elaine Mary Rees, B.Sc. (Lond.); Khubchand Isardas Thadani, B.Ag. (Bomb.), M.Sc. (Texas); Reginald Cory; Hugh Vandevaes Lely, B.Sc. (Edin.); and Surendra Chandra Banerji, M.A. & B.Sc. (Calc.).

The Rev. F. C. R. JOURDAIN, M.A., M.B.O.U., then gave a lantern demonstration of the bird-life of Bear Island and Spitzbergen, with a description of the Oxford Expedition to those regions in 1921.

The President, Dr. W. Rushton Parker, and Lt.-Col. Tull Walsh joined in the discussion following the exhibition.

Mr. B. MILLARD GRIFFITHS'S paper "The Heleoplankton of three Berkshire pools" was, in the absence of the author, read in title.

Mr. C. E. SALMON showed several sheets from his herbarium of the undermentioned plants and commented upon them.

1. *Sagina filicaulis* Jord. Obs. Frag. vii. 16 (1849), closely allied to *S. apetala* and *S. ciliata*, differing from the former by its sepals tapering and two usually mucronate, and also by their being appressed to the ripe capsule; from the latter by being more glandular, sepals less acute, and shorter in proportion to the ripe capsule.

2. *Cerastium subtetrandrum* Murbeck in Bot. Notiser, 1898, 259. This occurs in Orkney, sent by Col. H. H. Johnston, F.L.S., and reported from W. Sutherland by Dr. G. C. Druce, F.L.S. From *C. tetrandrum* it differs by being both pentamerous and tetrandrous, its floriferous part being higher up the stem, the lower bracts smaller than the stem-leaves, sepal tips drawn out into membranous, acute points, and seeds smaller.

3. *Arum italicum* Mill. A rare British plant only found in Cornwall, Dorset, Hants, Sussex, and Kent; but also in the Channel Islands. The following notes are taken from Sussex specimens. They differ from *A. maculatum* by the petioles being much longer in proportion to the blade, spathes longer compared with spadix, ovaries more numerous, rudimentary flowers with bases not tapering into filaments, and the spadix is differently shaped as well as larger. The leaves are not so well marked with white veins as in Continental specimens. They show above ground in late autumn or winter, whilst *A. maculatum* is much later.

Further remarks were contributed by Mr. H. N. Ridley, Mr. C. C. Lacaita, Mr. H. W. Pugsley, and Dr. E. J. Salisbury, and Mr. Salmon briefly replied.

April 6th, 1922.

MR. HORACE W. MONCKTON, Treas. & V.-P.,  
in the Chair.

The Minutes of the General Meeting of the 16th March, 1922, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Miss Flora Amelia Gordon; Prof. Walter Garstang, M.A., D.Sc. (Oxon.); Miss Kathleen Bever Blackburn, M.Sc. (Lond.); Miss Winifred Mary Ailsa Lomas, B.Sc.; and Mr. Benjamin Millard Griffiths, M.Sc. (Birm.), were admitted Fellows.

Mr. Percy Hutchinson Lamb was proposed as a Fellow.



The certificate in favour of George Valentine Chapman Last, M.R.C.S., L.R.C.P., Ph.C., was read for the second time.

The certificates in favour of Prof. Lucien Cuénot, Prof. Gustave Gilson, Prof. Jakob Wilhelm Ebbe Gustaf Leche, and Dr. Benjamin Lincoln Robinson, proposed as Foreign Members on the 2nd March last, were read for the third time.

The following were proposed as Auditors for the Treasurer's Accounts for the current financial year ending on the 30th instant, and were elected by show of hands:—For the Council: Mr. Stanley Edwards, and Mr. G. W. E. Loder, M.A.; for the Fellows: Mr. H. R. Darlington, M.A., and Mr. H. N. Ridley, C.M.G., M.A., F.R.S.

The first communication was by Dr. A. B. RENDLE, F.R.S., Sec.L.S., who showed a seedling of the Red Horse-chestnut (*Æsculus rubicunda*) in which a new terminal bud had been developed to replace the original shoot (plumule) springing from the seed. The original main shoot (epicotyl) had been broken some distance below the plumule; but after a few days a new growth was seen to have covered up the broken section, and gradually to develop into a new terminal bud. The new bud did not resemble the plumule, which produces at once a pair of large compound leaves of a similar character to the adult foliage, but suggested a normal terminal bud the outer leaves of which are imperfect, the leaves of the perfect form being protected in the interior of the bud. Adventitious buds are very common in plants, but the speaker did not know of a similar case of direct replacement of the plumule as the result of injury.

Mr. T. A. Dymes and Mr. H. N. Dixon contributed further remarks, Dr. Rendle replying.

The next communication was a paper by Mr. L. A. BORRADAILE, M.A., communicated by Prof. E. S. Goodrich, F.R.S., Sec.L.S., entitled "The Mouth-parts of the Shore Crab, *Carcinus maenas*," illustrated by a series of lantern-slides.

Sir Sidney Harmer, K.B.E., F.R.S., Lt.-Col. J. H. Tull Walsh, Prof. W. Garstang, and Prof. Goodrich, F.R.S., Sec.L.S., took part in the discussion which followed, and the author replied.

The last paper was by Mr. CHARLES TURNER, F.C.S., on "The Life-History of *Staurastrum Dickiei*, var. *parallelum* (Nordst.)," and was communicated by the General Secretary. (See Abstracts, p. 59.)

Dr. A. B. Rendle and the Chairman contributed further remarks on the interest of the subject of the paper, which was illustrated by numerous lantern-slides.

May 4th, 1922.

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 6th April, 1922, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Prof. John Lloyd Williams, D.Sc., Miss Elaine Mary Rees, B.Sc. (Lond.), Miss Edith Philip Smith, B.A. (Oxon.), Mr. Percy Appleyard, F.C.S., Mr. Douglas Miller Reid, Mr. Edwin Ashby, and Mr. Sydney Garside, M.Sc., were admitted Fellows.

A certificate in favour of Percy Hutchinson Lamb was read for the second time.

Cecil Victor Boley Marquand, M.A. (Cantab.), and Charles Turner, F.C.S., were proposed as Fellows.

Prof. Lucien Cuénot, Prof. Gustave Gilson, Prof. Jakob Wilhelm Ebbe Gustaf Leche, and Dr. Benjamin Lincoln Robinson were balloted for and elected Foreign Members.

Mr. EDWIN ASHBY exhibited pressed specimens of Orchids from South Australia including a number of the "spider-like" members of the genus *Caladenia*, and the green-hooded forms of the genus *Pterostylis*: many of these have a sensitive labellum which on the entrance of an insect closes up the opening for a short period: Mr. Ashby suggested that this was for the purpose of fertilization. A member of the genus *Thelymitra*, which only open their bright-coloured petals in hot bright sunshiny days, and two species of *Caleya* were exhibited, both extremely local in that state, and both provided with a sensitive labellum, which, on being touched, folds up in two separate movements.

A species of *Diuris* intermediate between *D. maculata* and *D. longifolia*, although now a fixed form, seems certainly to have been derived by hybridization. For many years before it was described by Dr. Rogers as *Diuris palachila*, Mr. Ashby had known it under his own name of *hybrida*, thinking it could hardly deserve specific rank.

A very beautiful form known as *Caladenia tutelata*, R. S. Rogers,

intermediate between the genera *Glossodia* and *Caladenia*, was shown and its characters explained.

Dr. A. B. Rendle, F.R.S., Sec.L.S., and Prof. F. W. Oliver, F.R.S., contributed further remarks, and Mr. Ashby replied.

The General Secretary read "A Relic of Henry Lyte's Library," a statement by Mr. HAROLD DOWNES, M.B., F.L.S., who presented an association volume from the library of HENRY LYTE (1529-1607) of Lytes Cary, Somerset.

"The volume which I have the honour of offering to the Society was discovered by myself in 1916 in a general dealer's shop in Taunton. It consists of two works of Antoine Mizauld, the French Physician (1520-1578), 'Alexikerus' and 'Nova et Mira Artificia,' bound together (Paris, 1564).

"The interest for us lies in the fact that the volume in question formed an item in the Library of Henry Lyte, and contains his autograph and various notes in his handwriting. At the top of the title-page of 'Alexikerus,' in red ink, is the signature 'Henry Lyte,' and across the printer's device (a mulberry tree) is "Henry Lyte, 1565." The signature is repeated on the title-page of the second work. A few trifling marginal notes are scattered through the volume, and many passages are underlined, the notes and under-scorings, as well as the signatures, being in red ink. At the end of the volume are two pages of MS. notes, mostly medical definitions or short descriptions of diseases. A list of Mizauld's works is printed at the end of the volume, and several of these are marked "H," which I assume to stand for "Habeo," and to indicate that Lyte possessed them. All the above are in Lyte's neat handwriting, as may easily be proved by comparison with specimens of his handwriting in the British Museum and elsewhere.

"As is well known, Henry Lyte was the translator of Dodoens's Herbal, the first edition of the translation being dated 1578. The French copy of "Dodoens" which Lyte used for this translation is in the British Museum, and contains copious notes in his handwriting. Henry Lyte was a member of the ancient family of Lyte of Lytes Cary, in Somersetshire. According to Pulteney he became a student of Oxford in 1546. He afterwards travelled, and at length retired to his estate, where he devoted his time to study, publishing several works of a historical character. He possessed a botanical garden, of which no trace remains. Contemporary with Turner, the latter was considerably his senior, and though they were near neighbours there seems no evidence that they held any communication, on botanical or other subjects. Lyte was twice married, and died in 1607 at the age of 78, being buried at Charlton Mackerel in his native county.

"The MS. notes in the volume under consideration were transcribed by me in 'Somerset and Dorset Notes and Queries,' 1917, of which a reprint will be found in the Society's Library."

## BIBLIOGRAPHY:—

- Pulteney, Richard. Progress of Botany, 1790.  
 Lyte, Sir H. C. Maxwell. The Lytes of Lytes Cary. (Proc. Somerset Arch. and Nat. Hist. Soc., 1892.)  
 George, William. Lytes Cary Manor House, Somerset. Bristol, n. d.  
 Arber, Agnes. Herbals: Their Origin and Evolution. Cambridge, 1912.  
 Downes, Harold. Henry Lyte of Lytes Cary. (Somerset and Dorset Notes and Queries, 1917.)

The President moved a vote of thanks to Mr. Downes for presenting this interesting volume to the Society's Library.

Prof. J. LLOYD WILLIAMS, D.Sc., then gave an account of the life-history of *Laminaria* and *Chorda*, illustrated with about 40 lantern-slides.

He remarked that up to a few years ago, Botany Students were taught that the Laminariaceæ, though they exhibit the highest advance in their external morphology and internal structure, possessed no method of sexual reproduction, but propagated themselves by means of asexual zoospores; and consequently they had to be classed, not with the higher, oogamous members of the Phæophyceæ, but with the lower Phæozooporeæ. The recent discovery of the development from germinating zoospores of two kinds of gametophytes, producing respectively eggs and antherozoids, compels us to revise our ideas respecting the group and its systematic position.

The Author, after describing in detail the structure of the zoospore, its behaviour in germination, and the cytology of the processes, stated that cultures of *Laminaria* three weeks old, and of *Chorda*, three or four months old, almost invariably showed the presence of two kinds of multicellular germlings, one kind large-celled, the other consisting of cells many times smaller. Sauvageau, by observing the development in his culture of abnormal sporangia of *Saccorhiza*, was able to prove that both kinds of germlings were produced from zoospores in the same sporangium. All attempts at carrying the discovery further by observing the actual liberation of the sexual cells failed until two years ago, when the Author witnessed the discharge of antherozoids and the process of fertilization. Lantern-slides were exhibited showing the two gametic nuclei within the eggs a little before fusion, and by comparison with the appearance of the sporophyte rudiment immediately after the first division of its fusion nucleus it was shown that the one condition can never be mistaken for the other.

The process of dehiscence of the oogonium and the liberation of the egg were explained in detail, and the difference between the behaviour of the inner wall in *Laminaria* and *Chorda* explained.

The Author had previously shown that Drew's supposed discovery of the sexual nature of the "Zoospores" was incorrect, but

as some botanists still believe in it, additional evidence was adduced showing that the organisms described by him could not possibly have been the zoospores of *Laminaria* but must have been colourless monads. The Laminariaceæ thus show distinct alternation of generations: the plant is the sporophyte; reduction of chromosomes takes place in the sporangium; there are two kinds of gametophytes—a male and a female, and the difference in size between the generations is exceedingly great. The sporophyte may be gigantic, as compared with other algae, whereas the gametophyte is microscopically small.

In the discussion which followed, Dr. D. H. Scott, F.R.S., Prof. R. R. Gates, Dr. Marion Delf, Dr. Lily Batten (visitor), and the President took part, the author replying.

May 24th, 1922.

*Anniversary Meeting.*

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 4th May, 1922, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Mrs. Alice Sophia Bacon, B.Sc. (Lond.), was admitted a Fellow.

Certificates were read for the second time in favour of Cecil Victor Boley Marquand, M.A. (Cantab.), and Charles Turner, F.C.S.

Major Charles Hunter, M.Sc. (Durh.), and William Nowell, D.I.C., were proposed as Fellows.

The Treasurer made his Annual Report on the Accounts of the Society, and the Statement (see pp. 24-26), duly audited, was received and adopted.

The General Secretary reported that since the last Anniversary the following had died or their deaths been ascertained, namely:—

12 Fellows.

Prof. William Beecroft Bottomley.	Dr. Walter George Ridewood.
Prof. George Simonds Boulger.	William D. Robinson-Douglas.
The Rt. Hon. Henry John Moreton,	Rev. Canon Frederick Charles
Earl of Ducie, P.C., G.C.V.O.	Smith.
John Firminger Duthie.	John Thomas Norman Thomas.
Dr. John Harley.	Major Charles Vipau, D.S.O.
Sir John Kirk, G.C.M.G., K.C.B.	Rev. Edward Adrian Woodruffe- Peacock.

## 3 Foreign Members.

Prof. Georg Albrecht Klebs.	Prof. Johann Wilhelm Spengel.
Prof. Jean Octave Edmond Perrier.	

That the following 11 Fellows had withdrawn:—

Sir Alfred Gibbs Bourne, K.C.I.E.	John Beavis Groom.
Dr. Horace Tabberer Brown.	Edwin Ernest Lowe.
Capt. Malcolm Burr.	Rev. Sir James Marchant.
William Miller Christy.	Charles John Cowper Mee-
Francis Joseph Clark.	Power.
Arthur John Fry Gibbons.	Miss Edith Grey Wheelwright.

During the same period 48 Fellows have been elected, of whom 39 have qualified up to the present. Also 4 Foreign Members and 1 Associate have been elected.

The Librarian's report was read, showing that donations from private individuals and editors amounted to 92 volumes and 594 pamphlets and parts, by exchange 179 volumes and 711 detached parts, by purchase 69 volumes and 291 parts; in all, the accessions amounted to 340 volumes and 1596 pamphlets and separate parts. Books bound amounted to 411: 50 in half-buckram, 149 in cloth, and 16 rebacked.

The General Secretary having read the Bye-laws governing the Elections, the President opened the business of the day, and the Fellows present proceeded to vote for the Council.

The Ballot for the Council having been closed, the President appointed Commander Walker, Mr. W. S. Rowntree, and Mr. A. W. Sheppard, Scrutineers; and these, having examined the ballot-papers and cast up the votes, reported to the President, who declared the result as follows:—

Prof. MARGARET BENSON, D.Sc.; \*Dr. GEORGE P. BIDDER, M.A.; E. T. BROWNE, M.A.; \*Dr. WM. THOS. CALMAN, F.R.S.; \*Prof. FELIX E. FRITCH, D.Sc.; Prof. E. S. GOODRICH, F.R.S.; Prof. Dame HELEN GWYNNE-VAUGHAN, D.B.E.; Sir SIDNEY F. HARMER, K.B.E., F.R.S.; \*Dr. ARTHUR WM. HILL, F.R.S.; Dr. B. DAYDON JACKSON; GERALD W. E. LODER, M.A.; HORACE W. MONCKTON, F.G.S.; \*FRANK A. POTTS, M.A.; Capt. JOHN RAMSBOTTOM, M.A.; Dr. A. B. RENDLE, F.R.S.; The Rt. Hon. LIONEL WALTER, BARON ROTHSCHILD, F.R.S.; Dr. E. J. SALISBURY; CHARLES EDWARD SALMON, Esq.; THOMAS ARCHIBALD SPRAGUE, B.Sc.; and Dr. A. SMITH WOODWARD, F.R.S.

(New Councillors are shown by an asterisk. The retiring Councillors were: Prof. V. H. BLACKMAN, F.R.S.; HENRY BURY, M.A.; STANLEY EDWARDS, F.Z.S.; C. C. LACAITA, M.A.; and R. I. POCOCK, F.R.S.)

The Ballot for the Officers having been closed in like manner, the President appointed the same Scrutineers, who having examined the ballot-papers and cast up the votes, reported the same to the President, who declared the result as follows:—

*President.* Dr. ARTHUR SMITH WOODWARD, F.R.S.

*Treasurer.* HORACE W. MONCKTON, F.G.S.

*Secretaries.* Dr. B. DAYDON JACKSON.

Prof. E. S. GOODRICH, F.R.S.

Dr. A. B. RENDLE, F.R.S.

The President then delivered an Address on "Observations on Crossopterygian and Arthrodiran Fishes," illustrating them by lantern-slides, in continuation of previous addresses (see p. 27).

TREASURERS ACCOUNTS FOR THE YEAR ENDED APRIL 30TH, 1922.  
(Presented at the Anniversary Meeting, May 24th, 1922.)

Receipts and Payments of the Linnæan Society from May 1st, 1921, to April 30th, 1922.

General Account.

	£	s.	d.
To Balance at Bankers on 1st May, 1921	463	16	6
" Cash in hand	7	10	11
" Interest on Investments	371	8	7
" Admission Fees	252	0	0
" Annual Contributions	2116	0	0
" Sales of Publications:—			
Transactions	£8	1	3
Journals	166	15	8
Proceedings and Catalogues	5	3	6
	180	0	5
" Fellows' postal account, deposits	12	7	3
" Donations in aid of Publications	278	10	0
" Miscellaneous Receipts	28	9	6
" Transfer from Separate Account	88	13	0

	£	s.	d.
By Taxes and Insurance	29	16	4
" Repairs and Furniture (includes Electric Fan			
£171 2 10, New Boiler £121 1 0, Lantern	424	18	7
£59 11 0)	126	2	1
" Coal, Electric Current, and Gas	939	0	4
" Salaries			
" Library:—			
Books (New Books £37 17 3)	£179	9	1
Binding	129	1	0
	308	10	1
" Expenses of Publications:—			
Printing	£728	7	7
Illustrations	127	18	7
Distribution	47	8	0
	903	14	2
" Miscellaneous Printing and Stationery	211	13	9
" Petty Expenses (including Tea and Postage)	£114	13	0
" Fellows' postal account	6	15	4
	121	8	4
" Linnæan Medal	15	5	0
" Purchase of £200 Midland Railway 2½ % Consolidated Perpetual Preference Stock	88	13	0
" Balance at Bankers, 30th April 1922	£511	6	5*
Do. deposits, Fellows' postal account	114	0	3
" Cash in hand	4	7	10
	629	14	6
	£3798	16	2

\* £425 already allocated for printing in hand.



£ s. d.

f. s. d.

To Balance at Bankers, 1st May, 1921:—	£ 8 18 6
Westwood Fund .....	6 6 0
Trail Award Fund .....	26 16 0
Crisp Award Fund .....	41 8 0
Hooker Lecture Fund .....	14 12 8
Tagart Fund .....	17 16 11
Goodenough Fund .....	1 1 0
Library Catalogue Fund .....	4 0 6
Annual Dinner Fund ...	117 1 8
Compounders' Donation Fund ...	238 1 3

By Transfer to General Accounts from Compounders' Donation Fund for Investment .....	£ 88 13 0
Grant from Westwood Fund for illustrations in A. M. Evans's paper.....	5 13 0
Purchase and Binding of Books (Tagart Fund) ...	12 11 0
Contribution to General Account from Goodenough Fund .....	4 0 0
Cost of Annual Dinner .....	34 19 6

Balance at Bankers, 30th April, 1922:—	£12 4 10
Westwood Fund .....	9 18 8
Trail Award Fund .....	33 16 2
Crisp Award Fund .....	63 11 11
Hooker Lecture Fund.....	38 18 0
Tagart Fund .....	18 4 10
Goodenough Fund .....	18 4 10
Library Catalogue Fund (including £76 7 5 transfer from Compounders' Donation Fund)	87 8 5
Annual Dinner Fund .....	3 7 6

Donations:—	
Library Catalogue Fund .....	10 0 0
Tagart Fund .....	16 0 0
Annual Dinner Fund Receipts .....	26 0 0
Compounders' Donation Fund .....	34 6 6
Interest on Investments:—	47 18 9
Westwood Fund .....	£8 19 4
Trail Award Fund .....	3 12 8
Crisp Award Fund .....	7 0 2
Hooker Lecture Fund .....	22 3 11
Tagart Fund .....	20 16 4
Goodenough Fund .....	4 7 11

£413 6 10

£413 6 10

*Investments on April 30th, 1922.*  
*General Account.*

£	s.	d.	Value,
450	0	0	30th April, 1922.
1000	0	0	£
1200	0	0	373 10 0
1000	0	0	@ 77
1000	0	0	@ 58
1000	0	0	@ 67½
500	0	0	@ 85½
3200	0	0	@ 53
			@ 99½
			@ 3184 0 0
			£6818 10 0

*Separate Account: Investments on April 30th, 1922.*

	£	s.	d.		£	s.	d.	
£870 9 5	{	232	5	0		153	5	8
	{	638	4	5	Metropolitan Water Board 3 per cent. "B" Stock (Westwood Fund) .....	@	66	
		100	0	0	Ditto (Hooker Lecture Fund) .....	@	66	
		252	18	0	New South Wales 3½ per cent. Stock, 1930-50 (Trail Award Fund) .....	@	78	
		530	0	0	2½ per cent. Consolidated Stock (Crisp Award Fund) .....	@	59	
		50	0	0	East India Railway 3½ per cent. Debenture Stock (Tagart Fund) .....	@	62½	
	{	50	0	0	(Westwood Fund) .....			
	{	50	0	0	(Tagart Fund) .....	@	89½	
£250 0 0	{	50	0	0	(Hooker Lecture Fund) .....			
	{	100	0	0	(Goodenough Fund) .....			
					4 per cent. Victory Bonds .....			
								223 15 0
								£1356 14 4

HORACE W. MONCKTON, *Treasurer.*

We have (in conjunction with the Professional Auditor, who certifies as to all details) audited the Accounts of the Society for the year ended 30th April, 1922, and found them correct. We have verified the Investments and Bank Balances.

Dated this 11th May, 1922.

W. B. KEEN, *Chartered Accountant.*

H. R. DARLINGTON, )  
 S. EDWARDS, )  
 G. W. E. LODER, ) *Auditors.*  
 H. N. RIDLEY, )  
 B. DAYDON JACKSON. )

## PRESIDENTIAL ADDRESS, 1922.

## OBSERVATIONS ON CROSSOPTERYGIAN AND ARTHRODIRAN FISHES.

AMONG the scientific contemporaries of Linnæus there were some who failed to realise the influence which his 'Systema Naturæ' was destined to have on the future progress of biology. Of these perhaps the most famous was the Dutch anatomist, Peter Camper, the bicentenary of whose birth falls within the present month. He not only published criticisms of part of Linnæus' systematic work, but also had so little appreciation of the important advance made by his new scheme of classification and nomenclature that he would scarcely admit it to be science. When he was invited to become a Foreign Member of this Society in 1788, he even refused to do so on the ground that he could not be associated with any institution which was named after Linnæus. Camper's original letter, which is still in the archives of the Society, is written in terms so emphatic that there can be no mistake as to his meaning. The lack of mutual appreciation between comparative anatomists and systematists, which has sometimes been manifest in later years, evidently dates back to the beginning of the new era inaugurated by Linnæus himself, and even at that time tended to prevent co-operation.

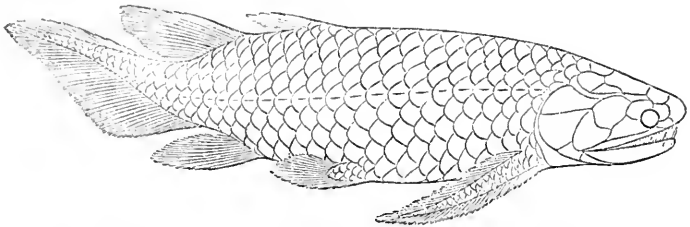
There is no subject in which the combined resources of the comparative anatomist (now morphologist) and the systematist are more needed than the interpretation of the links which lived in the Devonian period between the fishes and the early amphibians, which were then appearing. They are very different from the forms which might have been anticipated, had we been able to deduce them solely from a knowledge of the existing fauna. They therefore afford an interesting illustration of the importance of the study of fossils as an aid to understanding the life of the present day.

It has long been recognised that, among existing animals, the Dipnoan fishes, *Lepidosiren*, *Protopterus*, and *Ceratodus*, are most nearly intermediate between fishes and amphibians; but we now learn from fossils that the Dipnoi have remained essentially unchanged since their earliest known occurrence in the Middle Devonian\*. They have in the interval merely abandoned the fusiform shape which is adapted for free-swimming life, and have become more or less eel-shaped in adaptation to a wriggling and grovelling existence at the bottom of the rivers to which the last survivors retreated by the end of the Mesozoic era. They are therefore excluded by the nature of their dentition, their head-bones and other characters, from consideration as the possible ancestors of the Stegocephala (or "Labyrinthodonts"), which were the first amphibians. They may have arisen at the same time from a common stock—they probably did so,—but no links have been discovered between them and any true air-breathers.

\* L. Dollo, Bull. Soc. Belge Géol. vol. ix. (1895), pp. 79-128, pls. v.-x.

The real links in question, so far as we know them, are among the extinct paddle-finned fishes (fig. 1) which Pander and Huxley regarded as belonging to the same group as the existing *Polypterus* and *Calamoidichthys*. The fishes of this group (Crossopterygii\*) have indeed changed greatly in progress of time, and the further back they are traced the more nearly do they approach the early amphibians, which appeared very little later than themselves. If the existing *Polypterus* and *Calamoidichthys* alone were known, the relationship would be scarcely evident: for they are typically "mature" or even "senile" forms of the group, with an elongated body, modified cheek-plates, completed vertebrae, and highly specialised fins. The primitive Devonian genera, however, exhibit resemblances which are unmistakable and have long been

Fig. 1.



An Upper Devonian Crossopterygian, *Holoptychius Flemingi*, restored by Dr. R. H. Traquair, about one-eighth nat. size.

noticed †. The enlarged conical tusks on the vomerine bones, and in fact the whole appearance and arrangement of the teeth, resemble those of the typical Stegocephala. The peculiar structure of the teeth, with a more or less complex folding of the walls of dentine, is also nearly the same in the two groups. The complexity of the mandible in the early Crossopterygian fishes is much like that in the Stegocephala, and the symmetrically arranged dermal plates of the skull and cheeks correspond very closely. Some of the Crossopterygians, such as *Osteolepis* ‡ and *Diplopterus*, exhibit a pineal foramen, exactly as in all the Stegocephala. Some of them, such as certain Rhizodonts and *Coelacanth*s, also agree with the Stegocephala in having sclerotic plates round the eye. Finally, it is to be noted that the earliest Stegocephala have the pterygoid bones extended and nearly as large as those of the Crossopterygii §, the reduced pterygoids with

\* T. H. Huxley, Figs. & Descript. Brit. Organic Remains, dec. x. (Mem. Geol. Surv. 1861), p. 24.

† A. S. Woodward, 'Outlines of Vertebrate Palæontology' (1898), p. 123, fig. 81.

‡ E. S. Goodrich, Journ. Linn. Soc., Zool. vol. xxxiv. (1919), pp. 181-188.

§ D. Embleton & T. Atthey, Nat. Hist. Trans. Northumb. & Durham, vol. v. (1877), p. 207, pl. ii. (*Loxomna allmanni*), and p. 319, pl. vii. (*Anthracosaurus russelli*); D. M. S. Watson, Mem. & Proc. Manchester Lit. & Phil. Soc. vol. 57 (1912), no. 1.

large interpterygoid vacuities only appearing at the beginning of the Permian period.

As in so many cases of links among extinct animals, however, the known series is far from being complete. The Crossopterygii hitherto found have the upper jaw suspended to the cranium, while even the earliest Amphibia exhibit it directly fused with the cranium. As the Dipnoi among fishes show the same fusion of the upper jaw, they were for some years placed nearest to the Amphibia; but recent studies suggest that the fused (or autostylic) condition has arisen more than once as a mechanical adaptation to the working of powerful teeth, and it may be predicted that definite links between Crossopterygian and Amphibian jaws will sooner or later be discovered.

More difficult to understand are the differences which have lately been recognised in the basicranial axis. In the earliest known Amphibia, the Stegocephala, just as in those now existing, the basicranial axis, with its large parasphenoid bone, extends backwards as far as the occiput. In the Devonian and later Palæozoic Crossopterygii, and in the Cœlacanth family which survived until the Cretaceous period, this axis, underlain by the parasphenoid, extends backwards only so far as a point beneath the hinder margin of the frontal bones where there is always a transverse line of weakness in the cranial roof. At this point it ends abruptly, and its termination, round in transverse section, is impressed behind with a conical hollow for the notochord, as if it were the basioccipital itself. There is no doubt, indeed, that the fully developed notochord, surrounded only by non-ossified cartilage, extended as far forwards as this point, which appears to have been close to the pituitary region. The condition of the basal part of the skull in the adult early Crossopterygii thus corresponds closely with the temporary embryonic condition of the same part in a modern fish-skull. The arrangement has been clearly seen in several specimens of the Upper Devonian *Holoptychius* and the Carboniferous *Megalichthys*, but it is especially well-known in *Eusthenopteron* (fig. 2) from the Upper Devonian of Canada, in which the ossified otic-occipital region has also been observed\*. It is equally clear in the Devonian and the Cretaceous genera of the family Cœlacanthidæ †.

Between some of the Crossopterygii and some of the Stegocephala there is not much difference in the vertebral axis. The reduction and concentration of the median fins towards the end of the tail in the early Crossopterygii (fig. 1) may be regarded as marking the beginning of the disappearance of these structures. The links between the paired fins of the Crossopterygii and the four- or five-toed limbs of the Stegocephala, however, are still wanting. It can only be stated that the cartilages in some of the short-lobed fins, such as those of *Eusthenopteron*, approach more

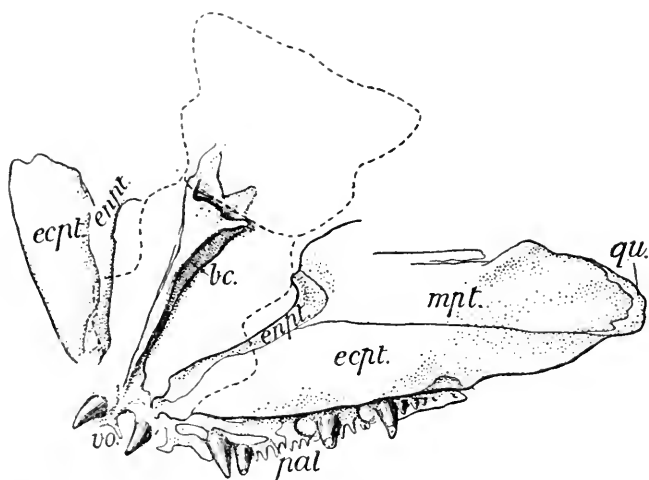
\* W. L. Bryant, Bull. Buffalo Soc. Nat. Sci. vol. xiii. (1919), pp. 6-19, pls. ii.-x.

† E. A. Stensiö, Palæont. Zeitschr. vol. iv. (1922), pp. 167-210, pls. iii.-v.; D. M. S. Watson, Ann. & Mag. Nat. Hist. [9] vol. viii. (1921), pp. 320-337.

closely those of an amphibian limb than the fin-structures of any other known fishes. Interesting suggestions as to their possible homologies have been made\*, and we may eventually discover the actual links among the Lower Carboniferous Stegocephala, of which only unsatisfactory fragments of the limbs have hitherto been seen.

It is reasonable to suppose that at the time when the Amphibia originated, there were among the fishes other abortive groups besides the ordinary Dipnoi which approached the higher grade. Among these I have long placed the curious armoured Devonian fishes which are now generally known as Arthrodira†. I have,

Fig. 2.



Crushed remains of the palate of *Eusthenopteron foordi*, from the Upper Devonian of Seaumenac Bay, Canada, one-half nat. size. The shape of the cranial roof, preserved on the opposite side of the slab, is shown in dotted outline. *bc.* basiscranial axis with hollowed hinder end; *ecpt.* ectopterygoid; *enpt.* entopterygoid; *mpt.* metapterygoid; *pal.* palatine; *qu.* quadrate; *vo.* vomer. (Brit. Mus. no. P. 6807.)

indeed, hitherto followed Newberry in regarding them as aberrant Dipnoi, but new fossils have convinced me that they belong to a distinct group and have not an autostylic skull.

The general appearance of the skeleton in the Arthrodira is best known from the specimens of a small species of *Coccosteus* (fig. 4 A) found in the Old Red Sandstone of Northern Scotland. The head is completely encased in bony plates, and the jaws

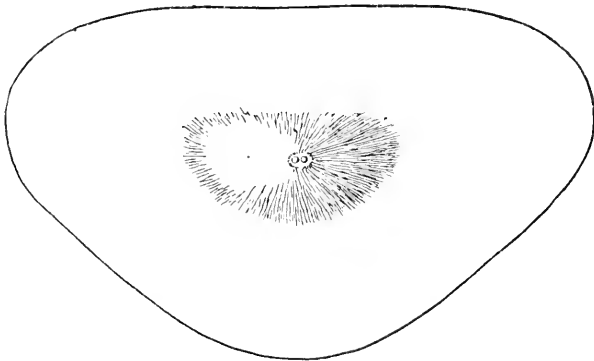
\* W. K. Gregory, Ann. New York Acad. Sci. vol. xxvi. (1915), pp. 353-369, pl. iv.

† A. S. Woodward, Catal. Foss. Fishes Brit. Mus. pt. ii. (1891), pp. 276-316, pls. vii, viii.; L. Hussakof, Mem. Amer. Mus. Nat. Hist. vol. ix. (1906), pp. 150-154, pls. xii., xiii.

are powerful cutting structures. The armour of the head is hinged at each side on the similar bony armour which encircles the anterior part of the trunk. The notochord must have been persistent, but the closely-set neural and hæmal arches are superficially calcified. The paired fins seem to have been present, though they are rudimentary. The median fins, of which only one small dorsal and remains of the caudal have been seen, are mere membranes without hard fin-rays. The supports of the dorsal fin are in double series, and directly supported by an equivalent number of neural arches beneath them, as in the Dipnoi and the earliest sharks.

The condition of the dorsal fin suggests that the Arthrodira are very primitive fishes, and it is interesting to note that they exhibit some other features which confirm this impression. It suffices to refer to the importance of the pineal organ of the

Fig. 3.

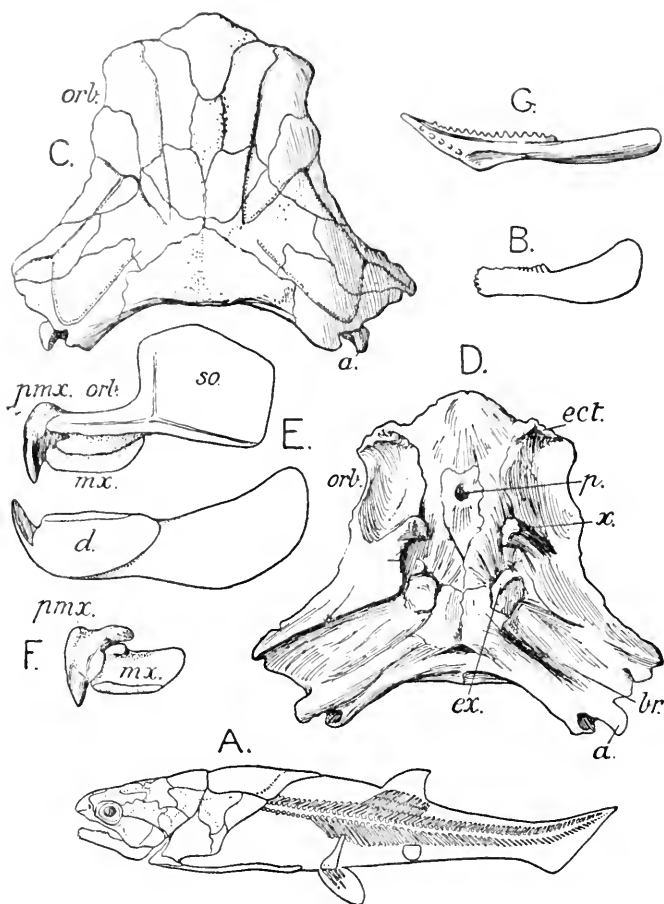


Pineal plate of *Titanichthys*, from the Upper Devonian of Ohio, U.S.A., inner view, one-half nat. size. The paired pineal pits or openings are seen in the middle area of thickened bone. (Brit. Mus. no. P. 9304.)

brain. In all head-shields in which the impression of this organ has been observed, there is a curious thickening of the surrounding bone, sometimes indeed an excessive thickening. The pit thus formed seems to end blindly, not opening to the exterior by a pineal foramen. As a rule it is single and must have lodged an ordinary simple pineal organ; but in *Titanichthys* (fig. 3), as now known from three or four specimens, the pit is distinctly paired for the accommodation of a symmetrically paired pineal organ. Prof. Dendy and others have already inferred from the facts of embryology that the pineal must have been originally a paired structure. *Titanichthys* is sufficiently near the beginning of the chordate series actually to show it.

The skull in the Arthrodira is very difficult to interpret, because most of the cartilages seem to have remained unossified.

Fig. 4.



Osteology of Arthrodira. A. Restoration of *Coccoosteus decipiens*, side view, from the Middle Old Red Sandstone of Scotland, nearly one-quarter nat. size. B. Dentary bone of same. C. D. Head-shield of *Dinichthys intermedius*, upper and lower view, from the Upper Devonian of Ohio, U.S.A., about one-quarter nat. size. E. F. Jaws of same, outer and inner views, same reduction. G. Dentary bone of *Diplognathus mirabilis*, inner view, from the Upper Devonian of Ohio, U.S.A., about one-quarter nat. size. a. articulation for body-shield; br. roof of branchial chamber; d. dentary; ect. lateralethmoid; ex. exocoipital; mx. maxilla; orb. position of orbit; p. pineal plate; pmx. premaxilla; so. suborbital cheek-plate; x. downward process from wall of cranium.



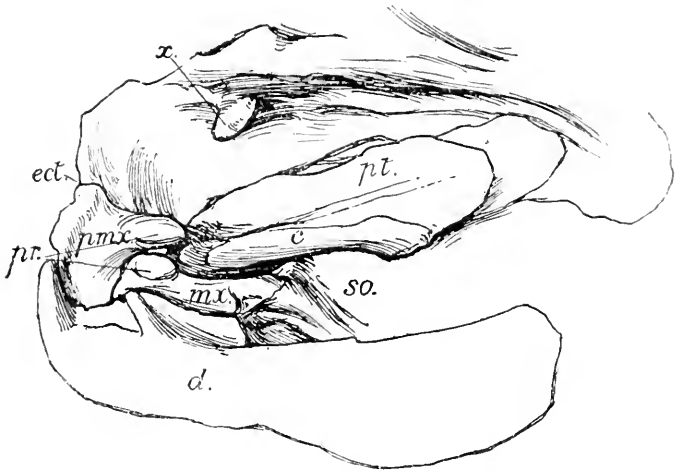
Fine large specimens of *Dirichthys* (figs. 4 C, 4 D) and its allies, however, are well preserved in the Upper Devonian flagstones of Ohio, U.S.A., and these are merely flattened by crushing. I have already pointed out that in *Homosteus* the bony cranial shield extends backwards beyond the brain \*, and there can be no doubt that in all Arthrodira it covers the branchial chambers (fig. 4 D, *br.*) behind the occiput. The so-called median and lateral occipital elements, therefore, are not strictly cranial bones, but really posterior to the cranial roof. The posterior end of the brain-case is marked by a pair of ossified cartilages (*ex.*) which seem to correspond with those named exoccipitals in the existing Dipnoi. The upper part of the lateral walls of the brain-case is also ossified, firmly united with the cranial roof, and extends backwards at each posterior angle to form part of the anterior wall of the branchial chamber. The wide antorbital portion of this ossification (*ect.*), transversely grooved to lodge the small anterior jaw-bone, may be regarded as the lateral ethmoid (or ectethmoid). Immediately behind the orbits the ossification gives rise to a pair of stout descending processes (*x.*), which are of undetermined nature. There is no trace of any ossification in the floor of the cranium, and no parasphenoid or other sheathing bone has hitherto been observed. The nasal and otic capsules also have not been seen, and there is no perforation in the cranial roof for an aqueductus vestibuli.

The bones of the cheek and jaw are well shown in their natural relative positions in a specimen of *Dirichthys* in the British Museum (no. P.9340). The suspensorium, however, is as usual not completely ossified, and there is only one isolated bone in each ramus of the mandible (fig. 5, *d.*). The single cheek-plate (*so.*) is articulated with the cranial shield by a very slight overlap, and covers the whole of the postorbital region of the cheek; it also extends beneath the orbit as a narrow bar, from which an almost semicircular flange extends downwards in contact with the outer face of the supposed maxilla (fig. 4 E). The cheek-plate is marked by a groove for the circumorbital sensory canal, from which a branch extends backwards close to and nearly parallel with the lower border. The bone which occupies the position of a maxilla (*mv.*), and may perhaps be so identified, is a very stout blade, longer than deep, with a sharp cutting edge at the oral border. It is firmly adpressed to the flange of the cheek-plate already mentioned, and at its upper border near the anterior end it bears a small but stout inwardly directed process (fig. 5, *pr.*). An anterior bone (*pmv.*) which seems to occupy the position of a premaxilla (and in some species is tuberculated on the outer face), is produced backwards at its upper end in a process which overlaps the process of the supposed maxilla, and is interposed between this and the lateral ethmoid of the skull, into a groove of which (fig. 5, *ect.*) the whole upper edge of the bone fits. This supposed premaxilla slightly overlaps the inner face of the anterior end of

\* A. S. Woodward, Proc. Zool. Soc. 1891, pp. 198-201.

the supposed maxilla, and its oral border is produced to a point which works against the outer face of the beak of the opposing bone of the mandible (fig. 4 E). The mandibular bone is evidently only one element of an otherwise persistently cartilaginous jaw\*. Its hinder half must have been sheathed at least on the outer face, but its anterior half would be exposed on the outer face of the jaw. Its oral border, opposed to the supposed maxilla, is a sharp, straight cutting edge, of which the outer surface would work against the inner surface of the upper bone. This cutting edge terminates forwards at a notch separating it from a beak-like

Fig. 5.



Crushed edge of head-shield and jaws of right side, inner view, of *Dinichthys intermedius*, from the Upper Devonian of Ohio, U.S.A. *c.* crushing edge of pterygoid arcade; *d.* dentary; *ect.* articulation for premaxilla on lateral ethmoid; *mx.* maxilla; *pmx.* premaxilla; *pr.* articular processes of maxilla and premaxilla; *pt.* pterygoid arcade; *so.* suborbital cheek-plate; *x.* downward process from wall of cranium. (Brit. Mus. no. P. 9340.)

anterior end, of which the postero-external face would work against the antero-internal face of the opposing upper bone. There is no facette for a symphyssial union of the mandibular bone with its fellow of the opposite side; and there seems to be no doubt that a cartilaginous symphyssial region was interposed between the two, because the opposing supposed premaxillæ, which fix their position, are well separated in the middle line by the rostral plate covering the mesethmoid. It has been suggested that

\* In an allied genus, *Dinomylostoma*, the cartilage of the mandible is sufficiently calcified to be preserved (C. R. Eastman, Bull. Mus. Comp. Zool. Harvard, vol. I. 1906, pp. 25, 26, pls. iv., v.).

there may have been unusual mobility of the jaws here; but the specimen now described shows that this was not the case. The cut surfaces of the jaw-bones are marked with a regular series of vertical striae, proving that the motion was directly up and down.

As shown by the same specimen in the British Museum, and to some extent by a second specimen (no. P. 9490), there lies within the upper jaw already described another arcade (fig. 5, *pt.*), which is evidently pterygoid though its relationships are not quite clear. It is a comparatively slender lamina of bone, which expands at its lower border into a broad hardened punctate surface (*c.*), more or less concave. No bone has been observed which could be opposed to this apparently crushing apparatus.

Jaw-bones which may be regarded as belonging to young individuals of *Dinichthys*, such as a mandibular bone described as *Cocosteus cuyahoga* by Clappole\*, bear conical denticulations along the oral border, and it is only after considerable abrasion by use that the border becomes a simple cutting edge. The toothed condition may therefore be regarded as primitive, and some genera, such as *Cocosteus* (fig. 4 B) and *Diplognathus* (fig. 4 G)†, retain it throughout life. In these the teeth are firmly fused in a single row to the oral margin of the bone, and it is interesting to note that they also occur along the anterior edge of the mandibular element. The latter fact seems to confirm the conclusion that the pair of mandibular bones did not meet at the symphysis, but were well separated by parts which have perished in the fossils. It should be added that in some genera, such as *Mylostoma*, the edges of the jaws are not modified for cutting, but bear crushing plates which are said to consist of dentine‡.

The new observations now recorded show that the Arthrodira are not so closely related to the ancestors of the Amphibia as I formerly imagined. It is, indeed, clear that they are not Dipnoi, and it is difficult to recognize much connection between them and the Crossopterygii. They are not Ostracoderms (as sometimes supposed), for they possess ordinary jaws and parts of paired fins, and their anterior median dorsal armour-plate is differently related to the underlying soft parts§. The usual reduction of the tooth-bearing edges of the jaws to cutting blades without teeth, and the strong development of the dermal armour, indeed, indicate that the Arthrodira are highly specialized members of the group to which they belong, and we cannot determine their precise relationships until we find and recognize their more normal ancestors.

Students of fossils are thus continually baffled by the imperfection of the geological record with which they have to deal. We have learned approximately how fishes passed into amphibians

\* E. W. Clappole, *American Geologist*, vol. xi. (1893), p. 167.

† J. S. Newberry, *Palaeoz. Fishes N. America* (Mon. U.S. Geol. Surv. no. xvi. 1889), p. 159, pls. xi., xii.

‡ B. Dean, *Mem. New York Acad. Sci.* vol. ii. (1901), pp. 101-109, pls. vii., viii.; C. R. Eastman, *Bull. Mus. Comp. Zool. Harvard*, vol. lii. (1909), pp. 261-269.

§ A. S. Woodward, *Proc. Linn. Soc.* 132nd Sess. (1920), p. 34.

not later than the Devonian period, but we still lack a multitude of links for which we must wait patiently until mere accident reveals them. We vaguely see that the earliest Dipnoi were more closely related to the earliest Crossopterygii than are the later Dipnoi to the later Crossopterygii. They were therefore nearer a common ancestor. To find this common ancestor, to recover more links, and to explain the problematical Arthrodira, we need fossils of still earlier date than those we already possess.

Lt.-Col. J. T. TULL WALSH then moved :—“That the President be thanked for his excellent Address, and that he be requested to allow it to be printed and circulated amongst the Fellows,” which resolution, having been seconded by Sir NICOLAS YERMOLOFF, was put and carried with acclamation.

The President having acknowledged the Vote of Thanks, proceeded to address Prof. EDWARD BAGNALL POULTON, F.R.S., and handing to him the Linnean Gold Medal. He said :—

Professor POULTON,—

The Council of the Linnean Society has awarded to you the Linnean Medal as a token of its appreciation of your long and important services to the advancement of Zoological science. You began by traversing a very wide field, from bone-caves and Pleistocene geology to the structure of the tongues of Marsupials, and you accomplished much histological work which culminated in your interesting discovery of true teeth in the embryo *Ornithorhynchus*. Your inclination, however, was always towards entomology, and you have for many years been regarded as the chief exponent of the phenomena of protective resemblance and mimicry in insects. With persistent industry you have brought together an immense array of facts from all parts of the globe in support of the view that these appearances are adaptive in their nature, and furnish strong evidence of the potency of natural selection. You have stimulated naturalists and collectors everywhere to observe and record such facts, and to send home illustrative specimens which you have added to the Hope Collection at Oxford. During your tenure of the Keepership of this collection, indeed, you have entirely changed its character. From being a vast series of specimens interesting mainly to systematists of the old school, you have made it into a great museum illustrating variation, geographical distribution, mimicry, and other phenomena important for the theory of evolution. With the co-operation of Mr. Arthur Sidgwick you have devised an accurate and comprehensive nomenclature to include all cases of protective and aggressive resemblance, thus clearly marking the difference between the mimicry discovered by Bates, and the cases which fall under the head of “synposematic association” as explained by Müller. You have also done most valuable experimental work on “variable protective resemblance,” especially demonstrating

the dependence of the coloration of certain larvæ and pupæ on the character of their surroundings, and disproving the suggestion that the observed effects are due to any direct influence that might be called "photographic." Your experiments have enabled you in many cases to determine within narrow limits the period during which the nervous system becomes or remains sensitive to the effective stimulus, and during which the ultimate colour-result becomes fixed. They have also demonstrated the direct transference of the green pigment of plants to the tissues of the caterpillars feeding on them.

These and other researches have led you to be a consistent upholder of the Darwinian position with regard to natural selection as the dominant factor in evolution. In your complete rejection of Lamarckism and such speculations as Darwin's pangenesis, you may even be described as more Darwinian than Darwin himself.

While occupied with your own researches and advancing science by your writings, you have always been a most generous and appreciative helper of other workers in your subject. You have been especially successful in stimulating young collectors of insects to extend their interest to the broader problems of biogenomics and make real scientific progress. In wider spheres you have also taken a most active part in work for the promotion of biological science, and the Linnean Society remembers with gratitude your services both on the Council and as President. I am sure the whole Society shares in the pleasure and satisfaction with which the Council gives you this mark of its esteem.

The recipient feelingly acknowledged his gratification at the award.

The General Secretary then placed upon the table the obituaries of deceased Fellows and Foreign Members, and the proceedings terminated.

#### OBITUARY NOTICES.

ODOARDO BECCARI (1843-1920).—Odcardo Beccari, the third child of Giuseppe di Luigi Beccari and the first of his mother Antonietta, was born in Florence, 16th November, 1843. Losing his mother at six years of age, he was confided to the care of a maternal uncle. In due course he entered the college now known as the Nazionale di Luca in the spring of 1853, where he found the Abate Ignazio Mezzetti as Vice-Rector and Prefect of Studies, a devoted student of natural science, especially botany, and, noting the observant spirit in the boy, he specially taught him the beginnings of the science, and imbued him with a lasting love of plants; the pupil never forgot his first instructor, and long afterwards he dedicated a genus of Anonaceæ to his memory as *Mezzettia*.

In 1861 Beccari, having completed his course at Lucca, entered the faculty of Natural Science at the University at Pisa. His work in botany attracted the attention of the celebrated Giuseppe Meneghini and Pietro Savi; but the atmosphere was not sufficiently tonic, and he passed to Bologna in 1864, where A. Bertoloni was Professor; here he presented his thesis, "Illustrazione dell' *Arnoldia cyathodes*, Massal."

Soon after this he met with Giacomo Doria, just returned from a scientific journey in Mesopotamia, and the two young men became intimate. By the advice of one of our Fellows, John Ball, they determined to undertake the exploration of the then little-known Northern Borneo, especially Sarawak. Whilst his companion was making the needful preparations, Beccari came to London, and visited the British Museum and Kew to get an acquaintance with the Bornean and Indian floras. This was in 1865, when he made the acquaintance of the two Hookers; in 1908, when he visited Sir Joseph Hooker for the last time, the veteran said: "I knew he would become a famous botanist, but he has surpassed my expectations; he is the greatest biologist and systematist of the present moment; he has the intuition of what a species is."

To return to his first visit, Beccari was introduced to Darwin, and by Miss Burdett-Coutts presented to Sir James Brooke, Raja of Sarawak, who promised him help in his territory.

He sailed from Southampton to Borneo on the 4th April, 1865, meeting a brother and Doria, as arranged, at Suez: passing Aden they landed in Ceylon and visited Thwaites at Peradeniya, reaching Kuching, the capital of Sarawak, in June.

G. B. Beccari left for Japan in three months' time, and the two remained to prosecute their respective ends: by the beginning of March, Doria's health gave way, and Beccari accompanied his friend to Singapore to return home. For three years, 1865-68, Beccari remained in Borneo; his volume 'Nelle foreste di Borneo,' issued in 1902, gives a vivid picture of his life during this period. He returned to Italy in March 1868, and began in Florence to work out his collection, there founding the 'Nuovo Giornale Botanico Italiano,' which he directed during 1869-71; nevertheless he took advantage of a special expedition to Ethiopia in 1870 to go thither and return with a rich cargo of plants; he wrote an account of this journey, but for some unexplained reason it was not published.

Meanwhile he had been preparing himself for another expedition, attracted by the charm of the forest, and possessed of the methods for the best employment of the scheme, he further studied geodesy, astronomy, and meteorology. All being ready, at the end of 1871, with Luigi Maria d'Albertis, he started from Genoa for New Guinea, at that time quite unexplored; pausing a fortnight at Bombay, he continued to Singapore, finally reaching Batavia. After a short stay here, to acquire further information concerning Malaya, the traveller journeyed to Macassar in Celebes, Amboina, where a small schooner was chartered, and after many

difficulties Kapaor was reached. But this place was unhealthy, fevers raged, and quitting the spot on a wretched craft, they reached Dorei, and achieved the exploration of Mount Arfak as the crown of their endeavours. Besides geological specimens, many birds, mammals, beetles, and reptiles, he had 700 numbers in ample supply, together with spirit specimens.

The health of D'Albertis had now become so bad that it was impossible for him to stay in the tropics, so the two travellers, after great difficulty, came upon the Italian corvette, 'Vettor Pisani,' and upon this vessel D'Albertis embarked. In 1873, Beccari visited the islands of Aru and Kai, virgin soil for the botanist. Here under native huts thatched with leaves he set up his headquarters; his worst enemies were five species of ant, which threatened to destroy his specimens.

Beccari then returned to Macassar, and after resting and recruiting his health, again set out for the Molucca Islands; at another time, on board the Dutch ship 'Sumatra,' for a trip in 1874.

Before returning home, he much wished to try his luck again in New Guinea, but, as he wrote home, his finances were exhausted. From this difficulty his friend Giacomo Doria relieved him by inciting the citizens of Genoa to send the sum of 15,000 lire as a help.

Relieved and encouraged by this, Beccari journeyed by Batavia to Ternate, and Andai, to climb Mount Arfak. After a successful quest, he embarked in March 1876 for Java, in due course reaching Florence, where he was received with great enthusiasm. In the autumn of the following year he again started for Malaya, this time with Enrico D'Albertis, a cousin of his former companion, landing at Bombay and traversing India to Calcutta, thence to Singapore, onwards to Sydney, Melbourne, and Hobart; New Zealand; followed by a return to Singapore, and then to Sumatra, where he found the *Amorphophallus Titanum* and also the tiny Aroid *Microcasia pygmaea*.

In 1878 he left Batavia for his last journey: Padang, where he investigated the products; Singalang, where he stayed some time diligently collecting, till finally he directed his course homeward, and Florence was reached in the last days of 1878, closing his career as an explorer but beginning another as illustrator.

'Malesia' grew under his pen during 1877 to 1886, 3 volumes in quarto. Greatly to his mortification, when the third volume was half printed, the Istituto di Studi Superiori, which had financed the publication so far, ceased to provide the funds, but this becoming known in England, a contribution from the Bentham Fund enabled Beccari to complete his splendid work.

The magnificent folio 'Asiatic Palms' practically closed the authorship of Beccari: the second part appeared posthumously in 1921 as 231 pages and 6 plates in quarto, and 120 plates in collotype in folio; but the full extent of the work can only be assessed by reference to the ten pages of Bibliography,

drawn up by his pupil, Prof. U. Martinelli, in *Webbia*, v. (1921), 61 pp., with 2 maps, from whose vivid narrative the foregoing pages have been condensed.

An operation was performed on the 25th October, 1920, when Beccari had reached his 77th year; death ensued in his sleep without shock or pain. He was buried in the cemetery of the 'Misericordia' at Soffiana, near Florence.

Beccari was elected a Foreign Member of the Linnean Society, 3rd May, 1883. [B. D. J.]

WILLIAM BEECROFT BOTTOMLEY, the only son of J. Bottomley, of Fern Cliffe, Morecambe, was born at Apperley Bridge, Leeds, in 1863; educated at the Royal Grammar School, Lancaster, and King's College, Cambridge, whence he graduated in 1891, proceeding M.A. in 1900. At the age of 23 he was science tutor and lecturer in Biology at St. Mary's Hospital School, retaining that position till 1891, when he succeeded to the professorial chair of Biology at the Royal Veterinary College; two years later, on the retirement of Prof. Richard Bentley from the chair of Botany at King's College, Strand, Bottomley succeeded, an office he held from 1893 to 1921, when ill-health obliged him to retire.

Prof. Bottomley was much interested in such movements as the South Eastern Co-operative Agricultural Society, but he was perhaps best known by his experimental research on "bacterised peat" as a plant-stimulant and fertilizer, thereby securing nitrogen-fixing organisms for the benefit of the crops. One result was that as animals are in need of vitamins or accessory factors for their nutrition, so plants need the help of similar factors, which he termed "auximones," to thrive. Considerable success followed his efforts, and it is said that during the war, attempts were made to obtain cultures for an enemy nation, but without success.

He was elected Fellow of our Society, 3rd November, 1892; besides his Cambridge degree, he was Ph.D., and a Fellow of the Chemical Society since 1886. He died at Huddersfield on the 24th March, 1922. [B. D. J.]

GEORGE SIMONDS BOULGER, who died suddenly at his house in Richmond on the 4th May, 1922, was the son of Dr. Edward Boulger, and was born on the 5th March, 1853, at Betchingley, Surrey, and was educated at Wellington and Epsom Colleges, and for a short time at the Middle Temple; at the age of 23, in 1876, he was appointed Professor of Natural History at the Royal Agricultural College, Cirencester, where he became Honorary Professor in 1906; since 1884 he was Lecturer on Botany and Geology at the City of London College, and at the Imperial Institute since 1917. Much of his time was spent in coaching students and officers for examinations, and although the books noted below show great perseverance, he once admitted to the present writer, that he only wrote slowly: anyhow, his work was solid and good. From 1884 to 1890 he edited the 'Proceedings' of the Geologists'



Association, and for thirteen years also 'Nature Notes,' now known as the 'Selborne Magazine'; he was further a Vice-President of the Selborne Society.

Of the volumes from his pen may be mentioned 'Familiar Trees,' 2 series, 1885-86; 'The Uses of Plants,' 1889; 'Elementary Geology,' 1906; 'Wood,' 1902; 'Botany' [1912]; 'Plant Geography,' 1913; and associated with other writers we have:—with Mr. James Britten, 'A Biographical Index of British and Irish Botanists,' 1893, with supplements in 1899, 1905, and 1908 (a revised edition is only awaiting better times for printing to be brought out); with Mrs. Henry Perrin as artist, 'British Flowering Plants,' 4 vols., 4to, 1914; with Mrs. Jean A. Owen Visger, writing as J. A. Owen, 'The Country Month by Month,' 1904-5, fifth edition 1914; he also re-edited the Rev. C. A. Johns's 'Flowers of the Field,' 33rd edition, "entirely revised," 1911, and the same author's 'The Forest Trees of Britain,' 10th edition, "revised," 1912. In addition were many shorter papers published in the volumes of societies with which the author was connected.

He was elected Fellow of the Linnean Society on the 1st February, 1877; he was also a Fellow of the Geological Society from 1875. [B. D. J.]

OTTO BÜTSCHLI was born in Frankfurt, the son of a Swiss who had settled in that town, and married a lady who had lived all her life there, Emilie Kullmann. Our late Foreign Member was born on the 3rd May, 1848. After early school-days he turned his attention to mineralogic chemistry and palæontology, and at 17 years of age became assistant to Zittel; then spent twelve months at Heidelberg and graduated with mineralogy as his principal subject. It was now that interest for living nature awoke in him, and then it took possession of him. Except during one semester under Leuckart in Leipzig, he was self-taught. In 1869 to 1876 he lived with slight breaks in Frankfurt, served in the Franco-German War of 1870 as Landwehr officer, and then became for two years assistant to Möbins in Kiel. By this time he had published many papers on Protozoa, the development and morphology of invertebrates. In 1878, whilst still under 30 years of age, he became Professor of Zoology and Palæontology in Heidelberg, where he remained to the end, in spite of many flattering invitations elsewhere. Bütschli had the teaching talent, though towards the last he began to feel his duties somewhat of a burden; but the desired freedom to devote himself entirely to his 'Comparative Anatomy' was not attained till the close of the great war, during which period he had lost strength, and unable to withstand a severe illness which came on.

Studies on the cell-division and conjugation of the Infusoria was Bütschli's first important work, which appeared in 1876 in the Senckenberg Abhandlungen. This, together with Strasburger's work on the doctrine of the cell, established these observations on

firm ground; the phenomena of indirect cell-division was shown and explained, and karyokinesis set forth as occurring both in plants and infusoria.

Bütschli prosecuted his researches during the following years with the greatest energy, until in 1880 he undertook a thorough working out in Bronn's 'Klassen und Ordnungen des Tierreichs.' Nine strenuous years were given to these bulky three volumes, the subject being critically handled. The considerable progress of protozoa research during the last thirty years is inconceivable without Bütschli's labours.

From this he turned to Bacteria and Cyanophyceæ and the question of the constitution of Protoplasm connected with the phenomena of life. In his 'Untersuchungen über mikroskopische Schäume und das Protoplasma,' 1892, he set up his foam theory, with its associated ideas. He continued his investigation during succeeding years, and also in chemistry and crystallography, whilst still labouring as Professor of Zoology. He did not live to complete his 'Comparative Anatomy' though the bulk was written. He died on the 2nd February, 1920: his Foreign Membership of the Linnean Society dated from 7th May, 1908.

The writer is indebted to the notice of Bütschli, with a portrait, printed in the 51st Bericht der Senckenbergischen Naturforschenden Gesellschaft, in 1920. [B. D. J.]

FRANCIS MAULE CAMPBELL (1843-1920).—From additional information received since the notice of our late Fellow was printed in the 'Proceedings,' 1920-21, p. 45, the following amended statement is issued:—

In 1902, Mr. Campbell married the widow of Mr. Edward Yeeles, of Bath, who died in 1919: his second marriage took place at St. Mary Abbot's, Kensington, on the 20th October, 1920, to Mrs. Dunkerley, widow of the late Prof. Dunkerley, of Manchester University, her maiden name being Jebb.

The illustrious French zoologist, YVES DELAGE, Professor of Zoology at the Sorbonne and Membre des Académies des Sciences et de Médecine, died on October 8th, 1921, at 66 years of age. Coming to Paris as a young medical student, Delage was soon attracted to the study of zoology by his famous predecessor, Lacaze-Duthiers. Most of his researches were carried out at the marine laboratory of Roscoff, of which he later became Director. A most versatile and industrious worker, his researches cover a wide field. Among his early works may be mentioned an important memoir on the vascular system of Crustacea and another on the nervous system of the Planaria acela. But it is for his work on the life-history of the remarkable parasitic Crustacean *Sacculina* and on the Embryology of Sponges that he is best known. Delage first described the strange inversion of the germ-layers and the origin of the collar cells in the higher sponges. In later years he studied with his usual enthusiasm and originality

problems of experimental parthenogenesis, until the failure of his eyesight compelled him to give up practical observations and devote himself to writing. Already in 1895 he wrote a monumental volume on 'Les Théories de l'hérédité et les grands problèmes de Biologie générale,' and next year in collaboration with Hérouard began to publish the valuable and beautifully illustrated 'Zoologie Concrète.' Next he started the 'Année Biologique,' a very useful summary of current work on general zoology. Smaller books on 'Les Théories de l'Évolution,' 1909, and on 'La Parthénogénèse,' 1913, were published in collaboration with M. Goldsmith. Lastly, shortly before his death, appeared a treatise on Dreams. He was elected a Foreign Member on the 6th May, 1909. [E. S. G.]

HENRY JOHN MORETON, 3rd Earl of Ducie, born 25th June, 1827, was descended from Sir John Ducie, Lord Mayor of London and Banker to Charles I. Educated at Eton, he was one of the last survivors of the last "Montem" in 1844. He succeeded his father in 1853, and for a period of 70 years played the part of a great English landowner and an assiduous patron of science and art.

A geologist and botanist of some eminence, in virtue of which he was elected a Fellow of the Royal Society in 1855. He was Lord Lieutenant of Gloucestershire for 54 years, and at the time of his death he was "Father" of the House of Lords, of the Privy Council, of the Royal Society, of the Geological Society, and of many other Societies and Institutions.

Lord Ducie was a Fellow of the Linnean Society for upwards of 32 years, and although he took no prominent part in its proceedings he devoted his long life to the scientific study of plants, and especially to the study of trees, both coniferous and broad-leaved. He was also an ardent yachtsman and traveller, and at Tortworth in Gloucestershire, from his earliest years onwards, he amassed a large collection of trees from the temperate regions of the world. Of these he kept a painstaking record, and though he could never be induced to publish a catalogue, it may safely be said that the collection is surpassed by very few in the country. A leading authority on arboriculture, he was one of the first to recognise the value of the Douglas Fir (*Pseudotsuga Douglasii*), and one of the earliest and most famous plantations of this great timber tree may be seen at Tortworth. Some of the oldest specimens, too, of the Japanese Larch (*Larix leptolepis*) were planted by him; of the Chilean Beech (*Nothofagus obliqua*), which was introduced to this country by his old friend, Henry Elwes, F.R.S., and of the Oregon Chestnut (*Castanopsis chrysophylla*) he possessed perhaps the largest and oldest specimens in the country, not to mention numerous other trees, Oaks and Hickories in particular, with which he delighted to experiment with a view to economic or ornamental utility.

Lord Ducie shared with the late Monsieur Allard, of Angers, the rare satisfaction of being spared to see his plantations of broad-

leaved trees and conifers grow to maturity in his lifetime, and he used with pride to show to his friends specimens of such a size that it was almost impossible to believe that they had been planted by a living man.

A man of cultivated tastes, genial, liberal, and warm-hearted in disposition, thorough in everything he undertook, he maintained his faculties and interest in affairs to within a short time of his death. He died on October 28th, 1921, in his ninety-fifth year, and was buried in Tortworth Churchyard in close proximity to one of the most celebrated trees in England, an immense Spanish Chestnut, supposed to date from the reign of King John.

His only son having predeceased him without issue, he was succeeded by his brother, who, after an unbroken absence in Queensland of no less than 66 years, has recently returned to this country and taken up his residence at Tortworth.

[G. W. E. LODER.]

JOHN FIRMINER DUTHIE was the son of the Rev. A. H. Duthie, rector of Sittingbourne and afterwards of Deal; he was born on the 12th May, 1845, and educated at Marlborough College and at Jesus College, Cambridge, where he graduated B.A. in 1867, with a Third Class in the Natural Science Tripos. After a short tutorship in Somerset, he discovered *Polygala austriaca* in Kent, and then travelled in Italy and certain of the islands in the Mediterranean, collecting as he went, but his early gatherings were burned in a repository where they were deposited.

On the 15th April, 1875, he became a Fellow of this Society, and in the same year was appointed Professor of Natural History at the Royal Agricultural College, Cirencester; but the following year he was made Superintendent of the Botanic Garden at Saháranpur, vacant on the retirement of Dr. Jameson, and here he remained for twenty-seven years, retiring in 1903.

He drew up the account of Myrtaceæ in the second volume of the 'Flora of British India' (except five pages by Mr. C. B. Clarke on the tribe of Barringtoniæ), which came out in 1879; next, in 1881, he brought out his 'List of North-West Indian Plants,' and two years afterwards 'A List of the Grasses of North-Western India, indigenous and cultivated,' in the Report of the Department of Agriculture of the N.W. Provinces. Reports on the Government Gardens of 'Saháranpur and Mussoorie' for 1885 and 1886 followed. In 1885 was printed his account of Grasses growing on the Hissar Bir land, Punjab; and then came the folio 'Illustrations of the indigenous Fodder Grasses of the Plains of North-Western India,' Roorkee, 1886; the same year witnessed his account of a botanical tour in Rajputana, with yet another volume, 'The Fodder Grasses of Northern India,' in 1888; in 1896, 'A Botanical Tour in Kashmir.' He was also associated with Mr. (now Sir) Joseph Bampfylde Fuller, 'Field and Garden Crops of the North-Western Provinces and Oude,' in three parts, Roorkee, 1882-93, in quarto.

Besides his official work at Sahárunpur, Duthie lectured on systematic botany every year to the students at Dehra Dún, and usually accompanied them through the forests for demonstration.

On his quitting India in 1903, Duthie was appointed Assistant for India in the Herbarium at Kew, but illness in 1907 forced him to resign. Whilst there he revised, at the request of Sir Richard Strachey, the great collection known as the "Strachey and Winterbottom" plants, of which an unpublished but printed list was extant. A 'Catalogue of Plants found in Kumaon and Garhwal and the adjoining parts of Tibet,' forming pp. 63-122 of volume ii. of a projected work, dating from about 1854, was revised by Duthie, and came out as pp. 403-670 of E. T. Atkinson's 'Economic Products of the N.W. Provinces,' Allahabad, 1876; another and independent issue appeared "Revised and supplemented by J. F. Duthie," London, 1906. The latest work on which he was engaged was his 'Flora of the Upper Gangetic Plain,' of which two volumes and two parts of the third to Juncaceæ have appeared at Calcutta, 1903-15.

In 1879 he married Miss Coape-Smith, daughter of Colonel Coape-Smith, an officer stationed at Sahárunpur. In his literary labours he was careful, and spent much time in determining knotty points, but in consequence was not rapid in his work. He died at Worthing on the 23rd February, 1922. [B. D. J.]

A Fellow of long standing has passed away recently in the person of Dr. JOHN HARLEY, who died at his house, 'Beedings,' Pulborough, Sussex. He was born in Shropshire in 1833, where he studied the geology of the country round Ludlow, specially paying attention to the microscopical structure of the skeleton fragments in the Ludlow bone-bed, publishing a paper on the subject in the Quarterly Journal of the Geological Society in 1861.

During his medical studies about that period he turned his attention to vegetable parasites, with a view to gaining an insight into the cause of cancer and similar diseases in the human subject. In March 1863 a paper of his on the Mistletoe was read before the Linnean Society, followed by his election three months later. The author described the parasitic growth and its effect upon its host, and the action of the "sinkers" or suckers, which grow downward into the wood of the host, closing with the results observed on 31 woody trees infested with mistletoe.

He retired from his position as physician at King's College Hospital, London, in 1902, and removed to the house he had built, which he lived in during the remainder of his life. His geological collection was bequeathed to the Ludlow Museum.

[B. D. J.]

There are but few amongst the present generation who can remember seeing the late Sir JOHN KIRK, G.C.M.G., K.C.B., LL.D., M.D., D.C.L., Sc.D., F.R.S., in our rooms, for since the Society has occupied these apartments, he probably on only one occasion

entered the Meeting room, though from 1881–83 he was a Member of the Council. The last occasion on which the present writer met him was during the sittings of a Departmental Treasury Committee in 1900–01, when Sir John Kirk was punctual and constant in his attendance.

He was born at Barry, near Arbroath, on the 19th December, 1832, the second son of the Rev. John Kirk, of Arbilot. Attracted to botany, but choosing medicine as his profession, he entered Edinburgh University before completing his 15th year, and in 1854 he graduated as M.D. and L.R.C.S. The Crimean War broke out at that time, and Kirk organised a party of twenty Scottish medical students to proceed to the seat of war; he was appointed assistant physician at Renkioi, where he found time to collect a few plants and open up correspondence with Sir William Hooker at Kew.

Returning home in 1857 he was meditating seeking an appointment in Canada, when the opening occurred of his going with Livingstone on his Zambesi mission. They left England in March 1858, and soon after starting, Kirk acted as second in command during the five eventful years which followed. Coming back to the lower Zambesi, he employed all his skill in trying to save the life of Mrs. Livingstone, and then falling ill himself, he was ordered home, which he reached in 1863.

He accepted in January 1866 the post of surgeon to the political agency at Zanzibar; the next year he became Vice-Consul, a twelve-month later Assistant Political Agent, and in April 1873, Agent and Consul.

He married Helen Cooke in 1867 at Zanzibar, and three of his four children were born there. He energetically supported Sir Bartle Frere in his efforts to suppress the slave trade, which succeeded in 1873, after Frere had left. Kirk was raised to Consul-General and had honours bestowed upon him—C.M.G. in 1879, K.C.M.G. in 1881, and G.C.M.G. in 1886.

Lord Beaconsfield declined the offer to lease the mainland territories of the Sultan of Zanzibar, so the way was left open for other nations. In 1884, Gerhard Rohlfs was sent to Zanzibar as Consul-General in a ship of war, whilst Carl Peters and two companions in disguise stole across to the mainland treaty-making. But they were forestalled by Mr. H. H. Johnston under Kirk's direction. He left Zanzibar in 1886, and he lived to see the mistakes of 1884–86 rectified and German East Africa come under British administration. Pensioned in 1887, he was still used by the Foreign Office on several missions, and his last trip to Africa was to visit the Uganda Railway.

He settled at Sevenoaks soon after he returned, but still was actively employed, and it was not till 1911, when he was nearly 80, that he quitted his last office, Foreign Secretary of the Royal Geographical Society. Increasing dimness of sight at last prevented his reading, and he passed quietly away on the 15th January, 1922, in his 90th year.

About eight short communications from Sir John Kirk are in our Journal, mostly contributed from Kew where his plants had been examined, and one exhibition of rubber from *Landolphia* was shown in our rooms on the 15th June, 1882: but his chief botanical work was done in conjunction with Kew: he seems to have sent specimens from 1857 to 1896, ranging from Tropical Africa, Seychelles, Comoro Islands, and Somaliland. A full account is given in the 'Kew Bulletin' of this side of Kirk's activity (1922, no. 2, pp. 49-63). He was elected a Fellow of the Linnean Society on the 5th May, 1864, and at the time of his death was only exceeded by four seniors; he was elected F.R.S. in 1887.

*Papers by Sir JOHN KIRK, in the Society's publications.*

Journal, Botany:—

1. Dimorphism in the flowers of *Monochoria vaginalis*, viii. (1864) 147-148.
2. On *Musa Livingstoniana*, a new Banana from Tropical Africa, ix. (1865) 128.
3. On a new Dye-wood of the genus *Cudranea*, from Tropical Africa, *ib.* (1866) 229-230.
4. On the Palms of East Tropical Africa, *ib.* 230-235.
5. On the Copal of Zanzibar. Extract from a letter from John Kirk, M.D., F.L.S., dated Zanzibar, March 20th, 1868, xi. (1869) 1-4.
6. On Copal. Extract from a letter to Dr. Hooker, dated Zanzibar, November 13th, 1869, *ib.* (1871) 479-481.
7. Identification of the Modern Copal Tree, *Trachylobium Hornemanianum*, with that which yielded the Copal or Animi now found in the earth on the East Coast of Africa, often where no Copal-yielding trees now exist, xv. (1876) 234-235.
8. Note on specimens of *Hibiscus* allied to *H. Rosa-sinensis*, L., collected in E. Tropical Africa, *ib.* (1876) 478-479.—Remarks by Prof. Oliver, *ib.* 479-480.

Proceedings, 1880-82 [15th June, 1882], p. 35:—

9. Exhibition of specimens of the fruit, leaves, and rubber of *Landolphia florida*, from the Island of Pemba, north of Zanzibar: also balls and rubber beaters made and used by the natives of East Central Africa.

Transactions:—

10. On a new genus of Liliaceæ from East Tropical Africa (*Walleria*). xxiv. (1864) 497-499, t. 52.

[B. D. J.]

GEORG ALBERT KLEBS was born on the 23rd October, 1857, at Neidenburg in East Prussia, the third child of his father. He went to school first at Wehlau, where his parents were then living, leaving school there in August 1874, and proceeding to the Albertina, in Königsberg, to matriculate for the study of chemistry; but shortly after he found himself drawn to Natural History, in which he earnestly worked, and after several small contributions he drew up an account of the Desmids of East Prussia, which

attracted the notice of De Bary, who offered him an assistant's place in the Strasburg Institute, and in accepting it, he entered upon a new career. In January 1897 he put forward a new thesis on the East Prussian *Desmids* for his doctorate.

At this time De Bary had a crowd of disciples round him, such as Errera, Arthur Meyer, Stahl, Mattiolo, Pirotta, and with these Klebs came into the friendliest relations. A year of military duty closed the Strasburg life for him.

Desirous of learning in other fields of research, Klebs turned to Würzburg on being released from military duties, where Sachs was lecturing; here a year was spent, after which he migrated to Pfeffer's laboratory.

Klebs was just 25 when in October 1882 he betook himself to Tübingen. Here he set to work on 'Microorganismen' and 'Bau und Physiologie der Pflanzenzellen.' Special interest was repeatedly displayed by him in the structure of *Hydrodictyon*, and manuscript left by him shows that even late in life he resumed investigation on it. Another topic he took up was the germination of seeds.

In 1887, after Pfeffer had been called to Leipzig and Vöchting came from Basel to succeed him, Klebs went to Basel, where he was very successful, and there married a young wife, Luise Sigarart. His labours on the mechanism of the development of the lower organisms, and the systematic disposition of Algæ bore abundant returns.

In 1892-93 he was Rector of the University of Basel, and his address was on the relation of sex in Nature.

During the last decade of the nineteenth century, Klebs was enabled to erect a new botanic institute in Basel, but had hardly opened it, when he was called to Halle in succession to Krauss. Here also he had to busy himself with new buildings—a new laboratory and class-room and glass-houses were speedily completed. *Sempervivum* and *Sedum* were studied for variation, which led on to Klebs's first memoir on physiological chemistry.

In 1907, in consequence of the death of Pfeffer, he received a call to Heidelberg, which he gladly accepted, and there spent a series of successful years. Whilst here he was able, in 1910-11, to travel through Siberia, Japan, Java, and India, and with several companions to visit Armenia, the Caucasus, and Southern Russia in 1912; also, in 1913, a trip to Egypt with his wife.

Latterly he devoted his attention to the question of the amount of mineral matters taken out of plants, occasioned by rhythmic movement, light, and other circumstances. His nature was that of an investigator, and travelling gave the chance for so much that was new that he eagerly seized this, but the great war laid a heavy burden on him, and he turned to his researches.

On the 15th October, 1918, Klebs died of influenza after a short attack, and on the 18th he was cremated. He had been chosen to assume the position of Rector a few months later; many Universities had bestowed their honours upon him, our own Society electing him a Foreign Member on the 4th May, 1911.



A bibliography of his publications will be found in the *Berichte der deutschen botanischen Gesellschaft*, xxxvi. (1918), pp. (110)–(116). [B. D. J.]

The well-known Director of the Paris Muséum d'Histoire Naturelle, Professor JEAN OCTAVE EDMOND PERRIER, Membre de l'Académie des Sciences et de l'Académie de Médecine, was born at Tulle in 1844. His death on July 31st, 1921, deprived the French zoological world of a man of great administrative ability and social distinction, who took an active part in the promotion and organisation of scientific work. For many years he directed a marine laboratory in the little island of Tatihou, near Cherbourg. His own researches dealt chiefly with the Invertebrata. In 1874 appeared his remarkable memoir on the structure of Earthworms, and later many works on the anatomy and classification of Echinoderms. Among his many publications, always distinguished for lucidity and elegance of style, may be mentioned the volumes on 'Les Colonies Animales,' 'La philosophie zoologique avant Darwin,' 1884, 'Lamarck et le transformisme,' 1893, 'La terre avant l'Histoire,' 1920.

'La Tachygénèse ou accélération embryologique,' written in collaboration with Ch. Gravier, is an important contribution to comparative embryology. Since 1892, Perrier published at intervals several volumes of a comprehensive 'Traité de Zoologie,' of which he left in MS. the final part.

He was elected a Foreign Member of the Linnean Society on the 4th May, 1916. [E. S. G.]

RIDEWOOD, Dr. WALTER GEORGE; see p. 70.

A hard-working, enthusiastic naturalist is lost to the Society by the death of the Rev. EDWARD ADRIAN WOODRUFFE-PEACOCK, which took place at Grayingham Rectory on the 3rd February, 1922.

He was the eldest son of the well-known antiquary, Edward Peacock, F.S.A., of Bottesford Manor, where he was born on the 23rd July, 1858; educated first at Edinburgh, he came up to St. John's College, Cambridge, and then at Bishop Hatfield's Hall, Durham, where in 1880 he took the degree of L.Th. After filling several curacies, he became Vicar of Cadney in 1890, remaining there till 1920, when he received the appointment as Rector of St. Radegunds, Grayingham.

He was always an indefatigable note-taker and recorder, especially as regards his native county. He was one of the founders of the Lincolnshire Naturalists' Union in 1893, and for ten years was its organising Secretary, and President in 1905–6; during its whole existence he was the mainspring of its activities. In 1909 he issued a 'Check-List of Lincolnshire Plants.' Phanerogamic botany was his ardent study, and for years he had been engaged on a flora of his own county on ecologic lines; that MS. has been left to Cambridge. He was elected a Fellow of the Linnean Society on the 5th December, 1895; he is survived by a widow and three sons. [B. D. J.]

June 1st, 1922.

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the Anniversary Meeting of the 24th May, 1922, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

The President announced that he had appointed the following to be Vice-Presidents for the ensuing year:—Mr. E. T. BROWNE, Dame HELEN GWYNNE-VAUGHAN, Mr. HORACE W. MONCKTON, and Lord ROTHSCHILD.

Certificates were read for the second time in favour of Major Charles Hunter, M.Sc. (Durh.), and William Nowell, D.I.C.

William Frederick Neville Greenwood, F.E.S., was proposed as a Fellow.

The following were severally elected by ballot as Fellows:—Surendra Nath Bal, Ph.C.; George Valentine Chapman Last, M.R.C.S., L.R.C.P., Ph.C.; Percy Hutchinson Lamb; Cecil Victor Boley Marquand, M.A. (Cantab.); and Charles Turner, F.C.S.

Prof. A. C. SEWARD, F.R.S., then delivered the third Hooker Lecture, entitled "A Study in Contrasts: The Past and Present Distribution of certain Ferns," illustrated by lantern-slides.

The President added some remarks to those of the lecturer, to whom a hearty vote of thanks was given.

June 15th, 1922.

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 1st June, 1922, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Mr. Charles Turner, F.C.S., was admitted a Fellow.

The certificate in favour of William Frederick Neville Greenwood, F.E.S., was read for the second time.

William Henry Wilkins was proposed as a Fellow.

The President announced that Prof. H. O. JUEL, of Uppsala was present as a visitor.

Dr. A. B. RENDLE, F.R.S., Sec.L.S., showed two seedlings of Horse Chestnut from which the terminal bud had been removed by cutting through the epicotyledonary stem. In each case a number of minute buds appeared on the cut surface after the healing of the wound; the buds were arranged round the edge of the section corresponding with the position of the cambium-layer in the stem. A new shoot was also produced in the axil of each of the cotyledons. These new shoots resembled the shoot which is normally developed from the plumule, except that the first pair of foliage leaves was produced at the second node, while a pair of small scales was formed at the first node just above the level of the soil. The speaker referred to the seedling shown by him at a recent meeting of the Society in which the plumule had been replaced by one new symmetrically developed terminal bud.

Dr. A. W. Hill, F.R.S., commented upon the exhibition and compared it with his experience with the corm of *Cyclamen*.

The second paper was by Sir ARTHUR SHIPLEY, G.B.E., F.R.S., on "*Paria infernalis*," in which the conclusion is reached that Linnæus was probably stung by a virulent insect which may very well have conveyed to his system some pathogenic germs unknown at the time of the great naturalist. (See Abstract, p. 63.)

Mr. E. ASHBY exhibited a large series of Australian Chitons, and said that the leaf-sheaths of *Posidonia* and *Cymodocea* were the habitat of certain rare species.

Lt.-Col. J. H. Tull Walsh, Dr. G. P. Bidder, and Prof. E. S. Goodrich, F.R.S., Sec.L.S., contributed additional remarks.

Mr. T. A. SPRAGUE exhibited plants and illustrations concerning his identification of *Sison Ammi*, Linn., of which the type-specimen was on view. He stated that *Sison Ammi* is an Umbelliferous plant published by Linnæus in the first edition of the 'Species Plantarum' in 1753. It has hitherto been a puzzle to botanists. The elder Jacquin in 1773 identified it with a species now known as *Apium leptophyllum*; and Caruel in 1889 identified it with *Ptychotis ammoides*. But examination of the type-specimens in the Linnean Herbarium and the British Museum shows that it is *Carum copticum*, a well-known medicinal plant which yields the Ajowan seeds and Ajowan oil of commerce, from which thymol is obtained. Linnæus gave it the trivial name *Ammi* because he believed it to be the source of the "seeds of the true Ammi" of pharmacy: "*Ammios veri semina*."

The history of the drug Ammi goes back nearly 2000 years. Dioscorides, who lived in the first century of the Christian era, described it as having a minute seed with the flavour of marjoram. The illustration in the 'Codex Vindobonensis,' which dates from the sixth century, represents *Ammi Visnaga*. The Ammi

depicted by Fuchsius in the sixteenth century was *Ammi majus*; and the plant figured by Matthioli about the same time was *Ptychotis ammoides*. But when we turn to the beautiful plates of Umbelliferae published by Rivinius at the end of the seventeenth century we find that the official Ammi of that date was *Carum copticum*. This is confirmed by the specimen of Ammi in the herbarium of Ferro (at the British Museum), a Venetian apothecary who died in 1674. The geographical source of the drug also suggests that the true Ammi was *Carum copticum*. The best quality of Ammi was imported from Alexandria, but was actually grown in Arabia, where *Carum copticum* is still cultivated.

One point remains to be cleared up: the native country of *Carum copticum*. It is or has been cultivated in Egypt, Abyssinia, Arabia, Palestine, Mesopotamia, Persia, Afghanistan, Baluchistan, India, and the Malay Archipelago; but is nowhere certainly known in a wild state.

A discussion followed, in which Mr. E. G. Baker and Lt.-Col. Tull Walsh engaged, the latter remarking that in India Ajowan seeds were chewed for their carminative properties.

Next followed two papers by Dr. WALTER E. COLLINGE, "On the Terrestrial Isopod *Elumia colatum* (Miers)=*purpurascens*, Budde-Lund," and "On two Terrestrial Isopods from Madagascar."

Dr. W. T. Calman, F.R.S., remarked that one of the species named was in the British Museum, but described for the first time by the Author.

Mrs. ARBER, D.Sc., communicated a paper by the late Dr. E. A. NEWELL ARBER, entitled "Critical Studies of Coal-Measure Plant-impressions." It dealt with the following subjects:—I. A Revision of the British Upper Carboniferous species of the genus *Lepidostrobus*, Brongn., preserved as incrustations. II. *Lepidodendron lycopodioides*, Sternb., *L. ophiurus*, Brongn., and a new species. III. *Neuropteris obliqua*, Brongn., and *N. callosa*, Lesq.

Mr. C. TURNER showed the zygospores of *Staurastrum Dickiei* under the microscope; he also brought mounted slides for distribution. *Drosera rotundifolia*, Linn., and *Oryzococcus palustris*, Pers., were also laid on the table for the same purpose.

Dr. G. P. Bidder and Lt.-Col. J. H. Tull Walsh raised certain points which were replied to by the exhibitor.

Mr. JOSEPH BURTT-DAYV gave a summary of his paper, "A Revision of the South African species of *Dianthus*." A few words on the Geographical Distribution closed the paper.

Mr. F. N. Williams, Mr. T. A. Sprague, Mr. E. G. Baker, Dr. Stapf, F.R.S., and Dr. A. W. Hill, F.R.S., spoke on the paper.

## BENEFACTIONS.

LIST *in accordance with Bye-Laws, Chap. XVII. Sect. 1, of all Donations of the amount or value of Twenty pounds and upwards, received during the past Twenty years.*

## 1903.

- Royal Society: Contribution toward Dr. Elliot Smith's paper, £50.  
 Legacy from the late Dr. R. C. A. Prior, £100 free of duty.  
 Mrs. Sladen: Posthumous Portrait of the late Walter Percy Sladen, by H. T. Wells, R.A.  
 B. Arthur Bensley, Esq.: Contribution to his paper, £44.

## 1904.

- Royal Society: Grant in aid of third volume of the Chinese Flora, £120.  
 Frank Crisp, Esq. (afterwards Sir Frank Crisp, Bt.): Cost of Supplementary Royal Charter.  
 The same: Bulliard (J. B. F.). *Herbier de la France*; *Dictionnaire*; *Histoire des plantes vénéneuses*; *Champignons*, in 10 vols. Paris, 1750-1812.

## 1905.

- Royal Society: First grant in aid of Dr. G. H. Fowler's 'Biscayan Plankton,' £50.  
 Executors of the late G. B. Buckton, Esq.: Contribution for colouring plates of his paper, £26.

## 1906.

- Royal Society: Second grant towards 'Biscayan Plankton,' £50.  
 Subscription portrait of Prof. S. H. Vines, by Hon. John Collier.  
 Royal Swedish Academy of Science: Copies of portraits of C. von Linné, after Per Krafft the elder, and A. Roslin, both by Jean Haagen.

## 1907.

- Royal University of Uppsala: Copy by Jean Haagen of portrait of C. v. Linné, by J. H. Scheffel (1739).  
 Royal Society: Third and final grant towards 'Biscayan Plankton,' £50.  
 The Trustees of the Percy Sladen Memorial Fund: First grant towards publication of Mr. Stanley Gardiner's *Researches in the Indian Ocean in H.M.S. 'Sealark,'* £200.

## 1908.

Prof. Gustaf Retzins: Plaster cast of bust of Carl von Linné, modelled by Walther Runeberg from the portrait by Scheffel (1739) at Linnés Hammarby: the bronze original designed for the façade of the new building for the Royal Academy of Science, Stockholm.

Miss Sarah Marianne Silver (afterwards Mrs. Sinclair), F.L.S. Cabinet formerly belonging to Mr. S. W. Silver, F.L.S.

## 1909.

The Trustees of the Percy Sladen Memorial Fund: Second grant towards publication of Mr. Stanley Gardiner's *Researches in the Indian Ocean in H.M.S. 'Sealark,'* £200.

Prof. James William Helenus Trail, F.R.S., F.L.S.: Gift of £100 in Trust, to encourage Research on the Nature of Proto-plasm.

## 1910.

Royal Society: Grant towards Dr. G. H. Fowler's paper on Biscayan Ostracoda, £50.

Sir Joseph Hooker: Gold watch-chain worn by Robert Brown, and seal with portrait of Carl von Linné by Tassie.

Prof. J. S. Gardiner: Payment in aid of illustrations, £35 0s. 6d.

Sir Frank Crisp: Donation in Trust for Microscopical Research, £200.

The Trustees of the Percy Sladen Memorial Fund: Third grant towards publication of Prof. Stanley Gardiner's *Researches in the Indian Ocean*, £200. (For third volume.)

## 1911.

The Trustees of the Percy Sladen Memorial Fund: Second Donation towards the publication of the third volume on the *Indian Ocean Researches*, £70.

The same: First Donation towards the fourth volume, £130.

## 1912.

The Indian Government: Contribution towards the illustration of Mr. E. P. Stebbing's paper on Himalayan *Chermes*, £46 15s. 2d.

The late Mr. Francis Tagart, £500 free of Legacy Duty.

The late Sir Joseph Dalton Hooker, O.M., G.C.S.I., £100 free of Legacy Duty.

The Trustees of the Percy Sladen Memorial Fund: Second Donation towards the publication of the fourth volume on the *Indian Ocean Researches*, £140.

The same: First Donation towards the fifth volume, £60.

## 1913.

- Royal Society : Grant towards Dr. R. R. Gates's paper on Mutating *Oenotheras*, £60.  
 Sir Frank Crisp, Bt., Wallichian Cabinets, £50.  
 The Trustees of the Percy Sladen Memorial Fund : Second Donation towards the publication of the fifth volume, £200.

## 1914.

- Royal Society : Grant towards Miss Gibbs's paper on the Flora of British North Borneo, £50.  
 Miss Foot : Cost of illustration of her paper on *Euschistus*.  
 The Trustees of the Percy Sladen Memorial Fund : Third Donation towards the fifth volume, £10.  
 The same : First Donation towards the sixth volume, £190.

## 1915.

- The Trustees of the Percy Sladen Memorial Fund : Second Donation towards the sixth volume, £80.  
 Miss Foot : Cost of second paper on *Euschistus*, £32 10s.  
 Royal Society : Donations towards the cost of a paper by Mrs. Arber, D.Sc., £40.  
 The same : towards paper on Utakwa River plants by Mr. H. N. Ridley, C.M.G., F.R.S., £50.  
 Miss Marietta Pallis : Instalment of cost of her paper on *Plav*, £30.  
 Thomas Henry Riches, Esq. : Dr. A. R. Wallace's library on Natural History.  
 Sir Frank Crisp, Bt. : New shelving for Wallace's Volumes.

## 1916.

- Mr. E. Heron-Allen : Contribution to cost of paper on Foraminifera of N.W. Scotland, £44.  
 Messrs. H. Takeda and C. West : Contribution towards the illustration of their paper, £40.  
 Royal Society : Contribution towards the illustration of two papers by Prof. Dendy, £40.  
 The same : Contribution towards Mr. Swynnerton's paper on Form and Colouring, £70.  
 The High Commission for the Union of South Africa, per Dr. J. D. F. Gilchrist, for the illustration of his paper on *Jasus Lalandii*, £30.  
 Miss Marietta Pallis : Balance of cost of her paper on *Plav*, £90 16s. 6d.  
 Sir Frank Crisp, Bt. : Phototyped copy of Dioscorides from the 'Codex Aniciæ Julianæ' at Vienna.

## 1917.

- British Ornithologists' Union, etc.: Contribution towards cost of Mr. H. N. Ridley's paper, £20.
- The Royal Society: Second contribution towards the printing of Mr. C. F. M. Swynnerton's paper on Form and Colouring, £75.
- Sir Frank Crisp, Bt.: 'Lindenia,' Ghent, 1891-1901. 17 vols. sm. fol.

## 1919.

- Dr. B. Daydon Jackson: MS. index to Linnean Society's Journal, Botany, vols. xxi.-xl. (1884-1912) and the Botanic entries in the 'Proceedings' for the same period.

## 1920.

- The Royal Society: Third contribution towards the printing of Mr. C. F. M. Swynnerton's paper as above, £50.
- The High Commission for the Union of South Africa, for the printing of Dr. J. D. F. Gilchrist's paper on *Jasus Lalandi*, Part II., £60.

## 1921.

- The Percy Sladen Memorial Fund: Additional Grant in aid of publication of 'Transactions,' 2nd ser., Zoology, vol. xvii. part 4, £72 10s.
- The same: Grant in aid of publication of four papers on the Houtman Abrolhos Islands, £100.
- The Royal Society: Donation in aid of papers by Mr. N. E. Brown and Mr. S. L. Moore, £90.
- Dr. W. Rushton Parker: Donation of a large series of portraits of Naturalists and Persons after whom Genera have been named, and work on rearrangement and annotation of the entire collection.
- Prof. C. S. Sargent, F.M.L.S.: Eight volumes issued by the Arnold Arboretum, including "The Bradley Bibliography."

## 1922.

- The late Sir Joseph Hooker: Donation of his Medals and Decorations. (Reversion to Linnean Society on Lady Hooker's decease.)
- Anonymous donation in aid of publication of the late Dr. E. A. Newell Arber's paper, entitled "Critical Studies of Coal-Measure Plant-impressions," £60.



## ABSTRACTS.

Note on the Occurrence of *Brachiomonas* sp.

By W. NEILSON JONES, M.A., F.L.S.

[Read 1st December, 1921.]

THE sudden appearance of many of the simpler algæ in a locality and their equally sudden disappearance from it is a well-known phenomenon. The present communication deals with a mysterious visitation of this kind, which is worth putting on record on account of the rareness of the species in question and of the unorthodox conditions under which it was found growing.

*Brachiomonas* is a unicellular green alga belonging to the sub-family *Chlamydomonadeæ* of the family Volvocineæ. It is characterised by possessing a cell-body furnished with four regularly disposed hollow lateral horns, each of which is curved backwards, and a fifth posterior horn which is straight. At the apical end are two long cilia arising from a slight wart-like protuberance. The nucleus is situated anteriorly; a large pyrenoid is present towards the posterior end. The chloroplast appears, in most cases at least, to extend not quite to the tips of the horns: this is specially noticeable in the posterior horn. The protoplasm, however, extends to the distal end of each horn. Reproduction takes place (1) by the formation of four zoospores within the body of the mother-cell, which retains its motility up to the moment that the zoospores are liberated—or even a little longer; (2) by the formation of gametes of smaller size than the zoospores, 16 in each mother-cell, which conjugate in pairs to form a resting zygote. The organisms progress forward with a somewhat jerky movement, rotating about their longitudinal axes.

The botany garden at Bedford College possesses, among other possible locations for algæ, a small lily pond about 2 feet deep and a winding "ditch" of varying depth. The latter, owing to defects in the concrete, had been allowed to dry out in the summer of 1920 preparatory to repairs being carried out: in May 1921 it was for the most part dry, although some of the deeper parts still contained water.

During May, material of *Chlamydomonas* was required, and samples of water were collected from the garden and examined in the laboratory. In three cases the water was found to contain an almost pure culture of *Brachiomonas*. In every case these samples had been taken from shallow pools formed in the ditch by recent rain—the lily pond and the deeper pools showed no evident signs of the alga.

The appearance of this plant in London becomes the more interesting when its known distribution is considered. So far as I have ascertained, there are recorded in the literature only three

stations in which *Brachiomonas* has been found: Sheerness in Kent, Stockholm in Sweden, and Constanta on the Black Sea—in all cases in brackish water.

It must be presumed, therefore, that in the present case the alga was transported a distance of at least forty miles, either by wind to be deposited eventually by rain, or possibly by the sea-birds which visit Regent's Park constantly. One must not forget, however, that if the plant occurs at Sheerness, it may extend up the estuary of the Thames, even though unrecorded. Although the distance travelled in the latter case would not have been so great, the mechanism of transport remains an unsolved problem.

During the fortnight or more that the plant was kept under observation, it appeared to be in perfectly healthy condition, in spite of the fresh-water habitat.

The earliest account is that of K. Bohlin (1897), whose material was obtained from brackish water off the Swedish coast, the salt content of the water being about one-third that of the open sea. A second description is given by E. C. Teodoresco of material obtained by him at Constanta on the Black Sea. There the alga was found under similar conditions to those described by Bohlin, viz. in rock pools containing brackish water. A description in considerable detail is given by G. S. West (1907) of material obtained from brackish marshes at Sheerness. The alga was then reported to be common there in February: whether this is still the case I have not ascertained.

Bohlin distinguished two species, *B. submarina* and *B. gracilis*, the former possessing a more spherical and massive body and shorter horns. West referred the Sheerness organism to *B. submarina* after some hesitation, since the specimens showed much variability and were, on the whole, intermediate in form, none having processes so short as figured by Bohlin for *B. submarina*, nor the anterior part of the cell so flattened or the posterior horn so long as figured for *B. gracilis*. The London samples also showed very great variability. If there are two species of *Brachiomonas*, then I think it likely that both were present in the samples examined by me. An alternative view is that one is dealing with a single species which exhibits a great range of form.

To summarise:—*Brachiomonas*, a genus hitherto recorded only from three widely-separated stations in brackish water, is now put on record for London growing in fresh water under conditions which suggest that it may have been deposited with rain or brought by sea-birds. The individual plants showed great variability of form, ranging between the types figured by Bohlin as *B. submarina* and *B. gracilis*.

My thanks are due to Prof. F. E. Fritch for identifying the material as *B. submarina*.

#### References.

BOHLIN, K.—Zur Morphologie und Biologie einzelliger Algen. Öfversigt af Kongl. Vet.-Akad. Förhandl. 1897, No. 9, Stockholm.

- TEODORESCO, E. C.—Matériaux pour la flore algologique de la Roumanie. Bot. Centralb. Bd. xxi. Abt. ii. Heft 2.
- WEST, G. S.—Some critical Green Algae. Journ. Linn. Soc., Bot. xxxviii. (1908), pp. 279-289, tab. 20, 21.

Bedford College,  
Regent's Park, London, N.W. 1.  
Nov. 1921.

The Life-History of *Staurastrum Dickiei* var. *parallelum* (Nordst.).  
By CHARLES TURNER, F.C.S., Manchester. (Communicated  
by the General Secretary.)

[Read 6th April, 1922.

(PLATE 1.)

THE summer of 1921 was characterised by the long period of dry weather during June and July; the pastures were withered and the grass beside the railways was burned in large patches. Towards the end of the latter month I went to Glyn Ceiriog, a picturesque district about four miles south of Llangollen. The chief attraction is perhaps the little river Ceiriog, a tributary of the Dee, which flows down the valley and is a stream well known to the disciples of Isaac Walton for the excellence of the trout-fishing and for the Fish Hatcheries near Chirk. When the rainfall is abundant the stream becomes a torrent, but the long drought had caused its diminution, and the current had become negligible in the detached pools which had been left at the side of the stream. The district is in the Silurian formation, and there are quarries of granite and slate as well as deposits of limestone in the vicinity. I was looking out for Algae, and had a small microscope with me for the preliminary exploration. After a few days of introductory exploration, I settled down to a semi-stagnant pool by the side of the river, not far from a farm known to tourists as the place in which the chair of the celebrated Welsh Bard, Hugh Morris, is still to be seen. One of the slides which I have prepared has on it more than a hundred zygospores of *Staurastrum Dickiei* var. *parallelum* (Nordst.), in addition to those of two other Desmids, and the material has yielded literally thousands of these in all stages of development. I consider this to be largely due to the stagnation caused by the drought. I had living material under observation for about three weeks, and prepared many slides from it on the spot, in addition to several dozen which I have subsequently obtained from preserved specimens.

When I considered the great number of zygospores, I thought I should be certain to find many conjugating individuals, and, with that idea, I collected fresh material every day. When I returned home I found a large number showing the phenomenon which I had previously failed to recognise.

The condition of stagnation appears to me to be conducive to conjugation. Filaments of *Spirogyra* frequently become coated with débris of various kinds during the process, and the "bacteria" associated with the Glyn material constitute a notable feature. In addition to Desmids, enormous numbers of *Scenedesmus obliquus*, cells of a species of *Torula*, filaments of *Spirogyra* with zygospores, and *Eloponium* with oogonia, and many larvæ were present.

It is well known that Desmids have the power of locomotion, and that their movements are influenced by light. They usually set themselves so that the longer axis points in the direction of the strongest illumination, and they occasionally swing round on one extremity. These Desmids are almost as broad as they are long, nevertheless the movements probably occur, and the débris with which they are associated acts both as a help and a hindrance in this: it forms a substratum for their support and prevents them from becoming widely separated, so that they become associated in large numbers. It is rather noteworthy that the greater number of Desmids composing this association are almost of the same size, namely  $26\ \mu$  to  $30\ \mu$ ; they almost look as if they had been sifted, though there are at least three species present. They may be found in several positions, and their movements seem to be due to gamotactic rather than heliotactic force. The Desmids are arranged symmetrically and asymmetrically, both in front and in apical view as well as superposed.

The three-rayed form of Desmid is more abundant than four-rayed, and, as might be expected, the conjugation of the two three-rayed forms is the most common; I have several times seen the conjugation of a three-rayed with a four-rayed form, but have not yet observed the conjugation of two four-rayed modifications, though I have searched for this. It will be noticed that when the zygospores germinate, three-rayed Desmids sometimes occur in the same protoplasm with the four-rayed forms—that is to say, that the same spore gives rise to both kinds simultaneously. Desmids with a four-rayed end and a three-rayed end are also met with.

In the early stages of the conjugation of the Desmids there is a protrusion of protoplasm from the plants. In a specimen which I had under observation for an hour or so immediately after its removal from the river pool, the granules in the protoplasm were "dancing" conspicuously in this protrusion, and they continued in movement until I was obliged to leave the microscope. The material had dried up when I again examined it. As a rule there is no conjugation tube, and the contents of the two Desmids commingle in the water. I was fortunate enough to secure one specimen, however, in which the somewhat uncommon formation of the conjugation tube was well shown. The total length of the two Desmids and the tube was about  $70\ \mu$ . The Desmids were about  $28\ \mu$  in length and almost of the same diameter. The conjugation tube was about  $30\ \mu$  in length, perhaps  $35\ \mu$  in extreme measurement, there was some overlapping, and it varied in diameter from  $10\ \mu$  to  $15\ \mu$ . The Desmids were asymmetrically

placed, and there seemed to be a slight indication of difference of sex, as the contents of one Desmid were passing to the other without a corresponding return. The wall or membrane of the tube was very delicate and fragile. There are several examples which have become separated from their conjugating partner and show a small protuberance between the semi-cells. One specimen, which can only be regarded as a monstrosity, has developed a large bulging swelling, apparently well covered by a cell-wall, and it has continued its existence in a distorted form, deciding that it would not die until it was compelled to do so.

I think that it is quite possible that a conjugation tube may be formed more frequently than it is observed; any rough treatment would easily destroy it. Evidence of conjugation without its formation is abundant; this is the only specimen which I have seen with the tube really complete.

The spores are formed in the water between the two Desmids, and, at first, the protoplasm is surrounded by a gelatinous coating which changes into the hardened wall and develops spines. It is difficult to trace the early stages of the nucleus during the process of the growth, as the oil-drops, which constitute a prominent feature of the metabolic processes going on within the zygospore, obscure the other cell-contents. When the cell-contents are set free, they ultimately increase greatly in size, and the oil disappears, doubtless forming food for the young Desmids. If we consider the nucleus of the parents to be haploid and the conjugation nucleus to be diploid (of which I can offer no evidence), the subsequent division of the contents of the spore into four masses is probably of the nature of a reduction division, and this process may be commonly and easily seen. As previously mentioned, there were great numbers of zygospores produced last year, and I obtained many dozen showing this formation of four "Desmid Mother Cells" before the contents leave the spore. The oil-drops have gone, and a tetrad formation appears to have taken place; three nuclei with their surrounding protoplasm and colouring matter are seen in focus at the same time, and the fourth is concealed by the other three; they do not at first fill the spore, but are widely separated from each other and arranged near the spore coats; later they increase in size, and the four masses of protoplasm collectively fill the entire space, the division between them still remaining distinct.

The cell-contents appear to be of slightly lower specific gravity than the spore-coat. The first indication of a germination is the contraction of the plasma membrane, and the cell-contents, in almost every instance, come to the upper surface of the spore; I have seen very few dehiscing laterally—the contents escape in an upward direction; possibly the empty spore-coating sinks; at any rate, the contents do not remain associated with their former abode; the empty cases do not appear in numbers proportionate to those of the developing embryonic Desmids.

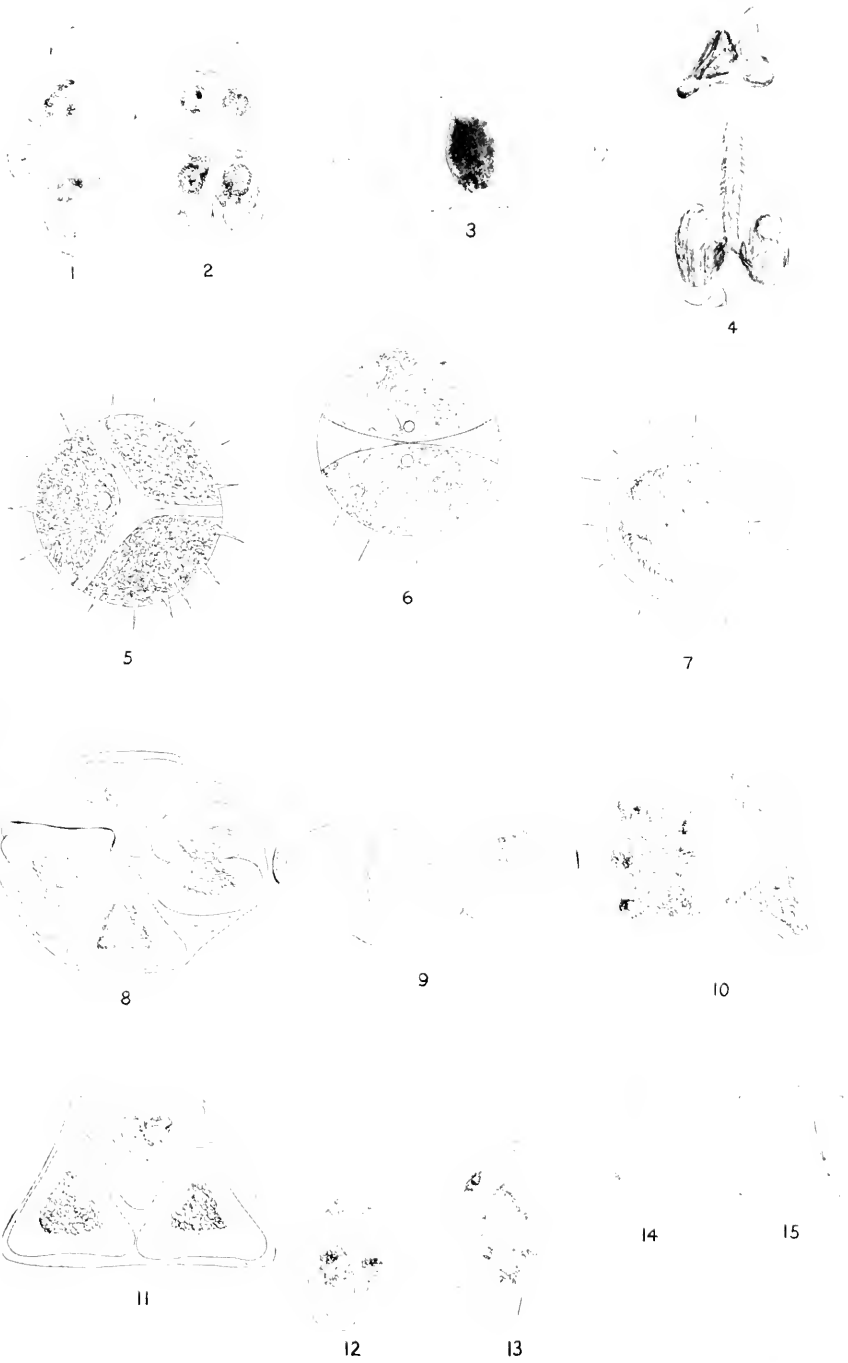
Three or four nuclei may be seen in the escaping contents, and four, three, two, or only one embryonic Desmid may result;

there is frequently an atrophied nucleus when the smaller numbers are formed. The division of the conjugation nucleus into four, and the accumulation of the cytoplasm etc. into four Desmid mother-cells, each with a distinct nucleus, is abundantly shown by my microscope preparations. There are a great many zygospores which show this most clearly. It is to be seen in the spores whilst they are still associated with the old semi-cells of the parent Desmids. The protoplasmic masses at this stage are connected by threads only, and are divided by broad spaces; they appear to increase in size in the older zygospores, many of which show the component parts of the tetrad consisting of naked masses of protoplasm, only separated by the merest line—they are practically in contact, except at the point where three mother-cells approximate. I was some time before I found the division of the cell-contents into two parts; this phase is much less abundant than the tetrad one.

When I find the young Desmids enclosed in the protoplasm, I have no hesitation in saying that they have been formed from the spore. There are many amœboid masses of protoplasm on the slides which do not show this, and they may, or may not, constitute the early stage of the escaped contents. The first indication of the production of the young Desmids is the formation of a hyaline district surrounding a central area, nuclear mass, or masses. These soon show the outlines of the Desmids. I find two almost mature in each mass most commonly: there are few slides out of the several dozen which I have prepared which do not contain at least one specimen showing this; many have three or four. The number showing one Desmid only is approximately the same; the majority are of the tri-radiate form, one or two show the tetra-radiate modification only. The number of clusters of three embryonic Desmids is less than that of the little clusters of two, and I have seen perhaps half-a-dozen clusters of four—the four nuclei do not always survive. I have found four dead, also eight empty semi-cells, enclosed in a surrounding membrane—the remains of the enclosing protoplasm.

The protoplasm surrounding the young Desmids is very granular at first, and I have three or four times seen the same protoplasmic mass containing three-rayed and four-rayed forms. One of the best examples of this escaped capture, one has moved, but I still have one or two slides illustrating this phenomenon.

The vegetative division of the Desmid is sometimes of the normal type, namely that a bulging protuberance is formed by each semi-cell, the two swellings being soon covered by a cell-wall and gradually increasing in size till they reach the dimensions of the old semi-cell. In other instances only one circular central cell is formed between the semi-cells; this sometimes elongates with the production of an hour-glass contraction in the centre, and two Desmids result. In a third method a central heart-shaped cell is formed by the asymmetric division of the bulging portion; the two terminal semi-cells approach each other, the



C. Turner, del. & phot.

Grout, photose.

LIFE-HISTORY OF A DESMID.





heart-shaped cell begins to divide at its broadest end, and the two Desmids which ultimately result are so arranged that conjugation would be a natural sequel.

I am indebted to Dr. O. Borge, of Stockholm, for very kindly identifying the specimen for me, and a beautiful little sketch of it which he was good enough to draw.

#### EXPLANATION OF PLATE 1.

##### *Staurastrum Dickiei* var. *parallelum*, Nordst.

- Figs. 1. & 2. Early stages of conjugation. Fig. 1. vertical view ; Fig. 2, front view.
- Fig. 3. Conjugation complete, with the early stage of the zygospore.
4. The unusual formation of a conjugation tube.
  5. The mature zygospore, showing the contents divided into four (the fourth being concealed by the other three).
  6. A zygospore with the contents divided into two parts.
  7. The contents of the spore contracted and escaping.
  8. The escaped contents of the zygospore, showing four embryonic Desmids (three vertical view, one front view) surrounded by the periplasm.
  9. Four Desmids (two vertical view, two front view) with their surrounding periplasm.
  10. Three Desmids (one of them a four-rayed form) produced in the escaped contents of a zygospore.
  11. The usual arrangement of three Desmids in the escaped contents (vertical view).
- Figs. 12 & 13. Two Desmids (fig. 13 with an atrophied nucleus) produced from a zygospore. The arrangement shown in these two figures is most frequently met with.
- Fig. 14. An embryonic four-rayed form with its surrounding protoplasm.
15. A Desmid (vertical view), showing a four-rayed end and a three-rayed end in the same individual.

The Desmids are  $26\ \mu$  to  $28\ \mu$  in length, and are of the same diameter. The zygospores are  $35\ \mu$  to  $38\ \mu$  in diameter, without the spines, which are  $8\ \mu$  to  $10\ \mu$  in length, making a total diameter of  $50\ \mu$  to  $55\ \mu$ .

##### *Furia infernalis*, Linnaeus.

By SIR ARTHUR E. SHIPLEY, G.B.E., F.R.S., F.L.S.

[Read 15th June, 1922.]

IN the classical tenth edition of his 'Systema Naturæ,' that of 1758, Linnaeus gives on page 644 the following list of genera of his Group INTESTINA: *Gordius* with three species, *Furia* with one species, *Lumbricus* with two species, *Ascaris* with two species, *Fasciola* with two species, *Hirudo* with eight species, *Myxine* with one species, *Teredo* with two species.

*Myxine*, the cyclostome fish, and *Teredo*, the boring mollusc, obviously had nothing to do with the INTESTINA.

Altogether his characterisation of the species enumerated above occupies only four and a half pages.

The history of *Furia* is a curious one. Dr. Daydon Jackson records in his interesting article on Linnaeus in the 'Encyclopædia

Britannica' that "whilst botanising in the spring of 1728, Linnæus was attacked by what he considered to be a venomous animal, afterwards named by him *Furia infernalis*, in allusion to the torment and danger he suffered from it."

The following is a translation of Rudolph's remarks on *Furia*\*:—

"With Blumenbach and others of our more recent writers I exclude *Furia*, a creature never seen by observers of nature spoken of as a worm and yet as flying in the air. Should you, however, incline to believe in such an animal it most assuredly will not belong to the Vermes, but will be the larva of an insect perhaps.

"C27. *Furia infernalis* vermis et ab eo concitari solitus morbus descripti a Dan. C. Solander. In Nov. Act. Upsal. vol. i. pp. 44-58.

"Versio germanica: D. Solander's Treatise on the Mordwurm and the disease caused thereby. Translated by J. A. E. Goeze in Der Naturforscher, St. xi. pp. 183-204.

"That Linnæus (Amœn. Acad. vol. iii. p. 322) regarded it as a dry worm (vermem siccum), but so elusive (evanidum) that it was not possible to define its genus or species. Neither did Solander ever see it, but constructs its character from accounts derived from other people: body filiform, continuous, equal, ciliated on both sides with reflexed adpressed spurs. That it descends from the air upon men and beasts and causes a disease called Skott—that is, stroke (ictum): very frequent in Northern Sweden, particularly in Lapland Torneânsi et Kjemensi.

"Analecta towards the history of *Furia infernalis* Car. Godofr. Hagen, [Præs., resp. C. Metzger] Regiomontan., [1790] 22 pp. 4to. For the existence of *Furia*, although he concedes the little creature (animalculum) never to have been seen by any person worthy of credit. Query: whether it is right to admit things of this sort into a system.

"Slägtet Dödsrott (*Furia*) by Adolph Modeer. In Nya Vetensk. Akad. Handl. 1795, pp. 143-167. Puts forward many things about the *Furia infernalis*, and classes it in the same genus with that fabulous little creature (animalculo) the *Filaria medinensis* (which he wrongly supposes to have bristles), a thing greatly to be reprobated."

The following account of the incident is taken from the Diary of Linnæus, translated for Maton's edition of Pulteney †:—

"In the spring of 1728, Linnæus went in a herborising excursion with Matthias Benzelstierna, to a very pleasant spot at Fågle-sång, where, having taken off some of his clothes on account of the heat, he was bitten in the right arm by a worm, called *Furia infernalis*. The arm immediately become so violently swollen and

\* 'Entozoorum sive vermium intestinalium Historia Naturalis,' vol. i. p. 171 (1808).

† 'A General View of the Writing of Linnæus,' by Richard Pulteney, London. 1805. 2nd edition, p. 516.

inflamed that his life was endangered, especially as *Stobæus* being about to set off for the Mineral waters of *Helsingborg*, he was left to the care of \* \* \*. Snell, however, having made an incision, the whole length of his arm, restored him to his former health. He passed, therefore, the summer vacation with his parents in Småland."

Nobody seems to have been able to identify this "pessima omnium," as it is called in the Tenth Edition. We may, I think, follow the example of Railliet and regard it as one of the "parasites fabuleux." What probably stung Linnæus was a virulent insect, which may very well have conveyed to his system some pathogenic germs unknown in the time of the great systematist.

# ADDITIONS AND DONATIONS

TO THE

## LIBRARY.

1921-1922.

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**Abreu** (*Dr. Elias Santos*). Monografía de los fungivoridos de las Islas Canarias. (Mem. R. Acad. Cienc. Artes, xvi.)

4to. *Barcelona*, 1920. **Author.**

— Monografía de los Phoridos de las Islas Canarias. (Mem. R. Acad. Cienc. Artes, xvii.) 4to. *Barcelona*, 1921. **Author.**

**Arnold Arboretum.** Journal, vols. 1-3 Svo. *Cambridge*, 1919-21

**Atlases.** 'The Times' Survey Atlas of the World, 1922.

**British Museum (Natural History).**

British Antarctic ('Terra Nova') Expedition, 1910. Natural History Reports. 4to. *London*, 1921.

Zoology. Vol. III. No. 7. Crustacea, Pt. V. Ostracoda. By R. W. BARNEY.

No. 8. Crustacea, Pt. VI. Tanaidacea and Isopoda. By W. M. TATTERSALL.

No. 9. Insecta, Pt. I. Collembola. By GEORGE H. CARPENTER.

Insecta, Pt. II. Mallophaga. By JAMES WATERSTON.

Vol. IV. No. 1. Protozoa, Pt. I. Parasitic Protozoa. By H. M. WOODCOCK and OLIVER LODGE.

Catalogue of the Fossil Bryozoa (Polyzoa) in the Department of Geology. The Cretaceous Bryozoa (Polyzoa), Vol. III. The Cribrimorphs—Pt. I. By W. D. LANG.

Svo. *London*, 1921.

### PLANTS.

A Handbook of the British Lichens. By ANNIE LORRAIN SMITH. Svo. *London*, 1921.

### GUIDE-BOOKS, ETC.

Guide to the Gallery of Birds in the Department of Zoology. Part I. Text and Atlas. Svo. *London*, 1921.

Summary Guide to the Exhibition Galleries. Svo. *London*, 1922.

Guide to the Specimens illustrating the Races of Mankind (Anthropology) exhibited in the Department of Zoology.

Svo. *London*, 1921.

Guide to the Reptiles and Batrachians exhibited in the Department of Zoology. Svo. *London*, 1922.

- Guide to the Whales, Porpoises, and Dolphins (Order Cetacea) exhibited in the Department of Zoology. Svo. *London*, 1922.
- Guide to the Specimens of the Horse Family (Equidæ) exhibited in the Department of Zoology. Svo. *London*, 1922.
- Guide to the Galleries of Mammals in the Department of Zoology. Svo. *London*, 1921.
- A Guide to the Fossil Remains of Man in the Department of Geology and Palæontology. Svo. *London*, 1922.
- A Guide to the Fossil Reptiles, Amphibians, and Fishes in the Department of Geology and Palæontology. Svo. *London*, 1922.
- Economic Series:
- No. 2.—The Louse as a Menace to Man. Its Life-History and Methods for its Destruction. By JAMES WATERSTON. Svo. *London*, 1921.
- No. 12.—The Cockroach. Its Life-History and how to deal with it. By FREDERICK LANG. Svo. *London*, 1921.
- No. 13.—Mites injurious to Domestic Animals (with an appendix on the Acarine Disease of Hive Bees). Svo. *London*, 1921.
- Instructions for Collectors:
- No. 1.—Handbook of Instructions for Collectors. Fourth Edition. Svo. *London*, 1921.
- No. 2.—Birds and their Eggs. Svo. *London*, 1921.
- Camus (E. G.). Iconographie des Orchidées d'Europe et du Bassin Méditerranéen. Text and Atlas. 4to. & Folio, *Paris*, 1921.
- Chauveaud (Gustave). La Constitution des Plantes vasculaires révélée par leur ontogénie. Svo. *Paris*, 1921. Author.
- Chopard (L.). See *Faune de France*. III.
- Cooper (C. S.) and Westell (W. Percival). Trees and Shrubs of the British Isles: Native and Acclimatised. 2 vols. 4to. *London*, 1909. Dr. W. Rushton Parker.
- Cunningham (J. T.). Hormones and Heredity. Svo. *London*, 1921.
- Davidson (John). The Cascara Tree in British Columbia. Svo. *Ottawa*, 1922. Author.
- Dean (William). An . . . . account of Croome d'Abitot . . . . with . . . . notices of the Coventry family, to which are annexed an Hortus Croomensis, and observations on the propagation of exotics, etc. 4to. *Worcester*, 1824. S. Savage.
- De Toni (G. B.). La flora marina dell' isola d'Elba e i contributi di Vittoria Altoviti-Avila Toscanelli. Svo. *Padova*, 1916. Author.
- Doncaster (Leonard). An Introduction to the Study of Cytology. Svo. *Cambridge*, 1920.
- Edwards (Henri Milne). Éléments de Zoologie. Svo. *Bruvelles*, 1837. Lieut.-Col. J. H. Tull Walsh.
- Encyclopædia Britannica. Eleventh Edition. Vols. 1-32. 4to. *Cambridge* [1911-22]. Dr. W. Rushton Parker.

- Faune de France.** I. Échinodermes. Par R. KOEHLER.  
 II. Oiseaux. Par P. PARIS.  
 III. Orthoptères et Dermaptères. Par L. CHOPARD.  
 Svo. *Paris*, 1921-22. Tagart Fund.
- Froggatt (Walter W.).** Some Useful Australian Birds.  
 Svo. *Sydney*, 1921. Author.
- Gallery of Portraits.** With Memoirs. Vols. I.-III.  
 Svo. *London*, 1833-34. Dr. W. Rushton Parker.
- Gwynne-Vaughan (Dame Helen).** Fungi: Ascomycetes, Ustilaginales, Uredinales. (Cambridge Botanical Handbooks.)  
 4to. *Cambridge*, 1922.
- Herdman (Sir William A.).** Variation in Successive Vertical Plankton Hauls at Port Erin. (Lancashire Sea-Fish. Lab. Rept. xxix.)  
 Svo. *Liverpool*, 1921. Author.
- CHARLES KINGSLEY and the Chester Naturalists. An Address delivered at the Jubilee Meeting of the Chester Society of Natural Science, October 13th, 1921.  
 Svo. *Chester*, 1921. Author.
- Jungersen (Hector F. E.).** See Steenstrup, *Japetus*.
- Kennard (A. S.) and Woodward (B. B.).** The Post-Pliocene Non-Marine Mollusca of the East of England. (Proc. Geol. Assoc. xxxiii.)  
 Svo. 1922. Authors.
- Koehler (R.).** See **Faune de France.** I.
- Lee (W. A.) and Travis (W. G.).** The Muscineæ of the Wirral. (Lancs. and Cheshire Nat. lxiv.)  
 Svo. 1921. Authors.
- Mattirolo (Prof. Oreste).** Phytoalimurgia Pedemontana. (Ann. R. Accad. Agric. lxi.)  
 Svo. *Torino*, 1918. Author.
- Newport.** Isle of Wight Natural History Society. Proceedings. Vol. I.→  
 Svo. *Newport*, 1921→
- Orchid Review, The** Edited by R. ALLEN ROLFE. Vols. i.-xxx.→  
 Svo. *Kew*, 1893-1922→
- Paris (P.).** See **Faune de France.** II.
- Percival (John).** The Wheat Plant. 4to. *London*, 1921.
- Petronievics (Branislav).** L'Évolution Universelle.  
 Svo. *Paris*, 1921. Dr. A. Smith Woodward.
- Printz (Henrik).** The Vegetation of the Siberian-Mongolian Frontiers. (The Sayansk Region.)  
 4to. *Trondhjem*, 1921. Author.
- Ratray (James).** A Botanical Chart or Concise Introduction to the Linneæan System of Botany. *Glasgow* [n. d.]. E. Step.
- Reid (Mrs. E. M.).** Recherches sur quelques graines pliocènes du Pont-de-Gail (Cantal). (Bull. Soc. Géol. France, (4) xx.)  
 Svo. 1920. Authoress.
- Rodger (Alex.).** A Handbook of the Forest Products of Burma.  
 Svo. *Rangoon*, 1921. Author.
- Rolfe (R. Allen).** See **Orchid Review.**
- Savage (S.).** A Little-known Bohemian Herbal.  
 4to. *London*, 1921. Author.

- Schinz (Salomon).** Anleitung zu der Pflanzenkenntniß und derselben nützlichsten Anwendung. Fol. *Zurich*, 1774.
- Scott (Dunkinfield Henry).** Studies in Fossil Botany. Third Edition. Vol. I. Pteridophyta. Svo. *London*, 1920. **Author.**
- Sendai.** Anatomischen Institut der Kaiserlich-Japanischen Universität Arbeiten. Heft i.-vii. Svo. *Sendai*, 1918.
- Smith (Annie Lorrain).** Lichens. (Cambridge Botanical Handbooks.) 4to. *Cambridge*, 1921.
- A Handbook of the British Lichens. See **British Museum (Nat. Hist.)**. Plants.
- Smith (Erwin F.).** An Introduction to Bacterial Diseases of Plants. Svo. *Philadelphia & London*, 1920.
- Steenstrup (Japetus).** Mindeskrift i anledning af hundredaaret for JAPETUS STEENSTRUPS dødsel udgivet af en kreds af naturforskere ved HECTOR F. E. JUNGERSEN og EUG. WARMING. Two volumes. 4to. *København*, 1914.
- Stone (Herbert).** A Text-Book of Wood. Svo. *London*, 1921. **Author.**
- Thiselton-Dyer (Sir William Turner).** Flora. Reprint from the Third Edition of a Companion to Latin Studies, edited by Sir JOHN SANDYS for the Syndics of the University Press, Cambridge, 1921. Svo. **Author.**
- Torcelli (Alfredo J.).** Obras completas y Correspondencia científica de FLORENTINO AMEGHINO. Vols I. and II. Svo. *La Plata*, 1913-14.
- Travis (W. G.).** See **Lee (W. A.)**.
- Trotter (Prof. Alessandro).** La Ginestra (*Spartium junceum*, L.) sua utilizzazione ed importanza come pianta tessile. 4to. *Napoli*, 1919. **Author.**
- Troup (R. S.).** The Silviculture of Indian Trees. 3 Vols. 4to. *Oxford*, 1921.
- Vallentin (Mrs. E. F.).** Illustrations of the Flowering Plants and Ferns of the Falkland Islands. With Description by Mrs. E. M. COTTON. 4to. *London*, 1921.
- Wall (Col. Frank).** The Snakes of Ceylon. Svo. *Colombo*, 1921. **Author.**
- Warming (Eug.).** See **Steenstrup (Japetus)**.
- Watson (White).** An explanation of a Tablet representing a section of the Strata in Bewerly Liberty, near Pateley Bridge, Yorkshire. Sm. Svo. *London*, 1800. **H. W. Monckton.**
- Westell (W. Percival)** See **Cooper (C. S.)**.
- Witherby (H. F.).** A Practical Handbook of British Birds. Vol. I. Svo. *London*, 1920.
- Wolle (Rev. Francis).** Fresh-water Algæ of the United States. Text and Atlas. Svo. *Bethlehem, Pa.*, 1887. **Tagart Fund.**
- Woodward (B. B.).** See **Kennard (A. S.)**.
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(The following Obituary was received too late to be inserted on page 49.)

WALTER GEORGE RIDEWOOD, who died on 21st September 1921, was born in London on 1st February 1867, and studied at the Royal College of Science from 1883 until 1887. He was interested in zoology, and from 1881 until 1917 he held a temporary appointment in the British Museum (Natural History). During most of this period he was also lecturer on Biology in the St. Mary's Hospital Medical School. He was especially skilful in making anatomical preparations, and a very large proportion of those in the central hall of the Museum are his work. While occupied with the preparations he availed himself of every opportunity for original observation and made many important contributions to our knowledge of the anatomy of the Vertebrata. His early paper on the structure and development of the hyobranchial skeleton and larynx in *Xenopus* and *Pipa*, published in the Journal of the Linnean Society, vol. 26, was his thesis when he received the degree of D.Sc. from the University of London in 1897. His later researches on the skull of certain Teleostean fishes, published partly by the Linnean Society, partly by the Zoological Society, were intended to be incorporated in a volume on the osteology of fishes, which unfortunately he never completed. His last memoir, on the structure of the vertebræ of sharks and rays, was an especially valuable work published in the Philosophical Transactions of the Royal Society in 1921. He also published a memoir on the gills of lamellibranch Mollusca in the Philosophical Transactions in 1903, and new observations on *Cephalodiscus* in the Report of the British Antarctic (Terra Nova) Expedition in 1918. Dr. Ridewood was elected a Fellow of the Linnean Society on the 2nd March, 1893, and served on the Council from 1903-06 and 1910-14. [A. S. W.]



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NOTES  
ON A  
CATALOGUE  
OF THE  
LINNEAN HERBARIUM.

BY

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KNIGHT OF THE SWEDISH ORDER OF THE POLAR STAR,

HON. PH.D., & A.M., UPSAL.;

GENERAL SECRETARY OF THE LINNEAN SOCIETY OF LONDON.

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M. Brongniart fait remarquer combien il est regrettable que l'on n'ait pas encore songé à publier un simple catalogue de l'herbier de Linné.—Bull. Soc. Bot. Fr. xiii. (1866) p. 135.



## FOREWORD.

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THE manuscript to which this refers is intended to supply an answer to questions which an enquirer is apt to put when examining Linnean specimens; the explanations are purposely shortened so as to compress the remarks into a moderate compass, usually a single line, but when more is needed, it is supplied on the opposite page (verso).

Certain frequent abbreviations are:—

A. = Alströmer.	K. = Kalm, König.
Ard. = Arduino.	Kh. = Kaehler.
Br. = Browne.	L., Loeffl. = Löffling.
C.B.S. = Caput Bonæ Spei = Cape of Good Hope.	M. = Magnol.
D. = Dickson.	R. = Rojen.
Gerb. = Gerber.	S., Sm., J. E. S. = Smith.
Gmel. = Gmelin.	T. = Thunberg, Tulbagh, Turner.
H.B. = Herb. Banks.	V <sup>o</sup> . = Verso, the left-hand page; the back of the Recto, the right- hand page.
H.L. = Herb. Linn.	
H.U. = Hort. Upsal.	
Hall. = Haller.	
Jacq. = Jacquin.	

Most of the Linnean contractions are expanded; other signs are explained in the 'Index' published in 1912, but republished here after revision.

For use of the remarks, the sheets of each genus in the herbarium are numbered at the top left-hand corner in green ink; these numbers refer to those in the first column of the manuscript Catalogue, then followed by the name of the species where given, and the number belonging to the species in the first edition of the 'Species Plantarum' 1753, when used by Linné; in a few cases the number is written without the name. Additions made in the 'Systema' ed. X, were denoted by capital letters in place of numbers, and these are also cited. Occasionally

figures in pencil may be seen upon the sheets; these are due to the preliminary attempt effected in 1747-50, which is still preserved, see Dr. J. M. Hulth's account of Linné's first sketch of his 'Species Plantarum' in the *Svensk Bot. Tidskr.* vi. (1912) 627-631.

The handwriting of Linné is simply copied; where nothing is added, it is his alone (the figures in the first column and the running numbers of the genera excepted). The handwriting of everyone else is shown by its being underlined, or in parentheses, or brackets; the cataloguer's comments are shown by an initial J. Long sentences on the face or the back of the sheets are shortened by omission of the middle, the beginning and the end being given before the name or sign of the writer. Labels as a rule are not copied, but the writer's name when known is given; as the label is open to the inspection of the enquirer, it does not need to be set out. Amongst the Mosses will be found many additions by James Dickson, who not only gave his opinion to Sir J. E. Smith, but largely added to the material; these are shown by the initial D.; the water-mark on these sheets is English.

Many of the numbers written on the sheets by Linné refer to books, as, for instance, 'Flora lapponica' and 'Flora suecica,' though not specified; others correspond to lists sent by correspondents, such as Tulbagh (*cf.* *Proc. Linn. Soc.* 1917-18, *Suppl.*), Alströmer (MS. of consignments in 1762, kindly supplied by Dr. J. M. Hulth), Allioni, Arduino, Sparrman and Thunberg, though the last two are not available.

A full account of the herbarium was issued in the Society's 'Proceedings,' 1911-12, *Suppl.*; as fresh information has accrued since that was issued, the introductory matter has been revised and reprinted in the following pages, as a Supplement to the 'Proceedings' for 1921-22.

B. DAYDON JACKSON.

Burlington House,  
December, 1921.

## INTRODUCTION.

---

IN the autumn of 1906 a suggestion was made to the Council of the Linnean Society of London, that a Catalogue of the contents of the Linnean Herbarium, together with a series of photographic illustrations of selected types from it, would be an appropriate publication for the celebration of the 200th anniversary of the birth of Carl von Linné.

Experiments showed that a fairly complete Catalogue of the sheets in the herbarium in question, would extend to about three volumes of the Society's Journal, and that its compilation would require from fifteen to eighteen months; the suggestion was therefore found to be impossible of fulfilment, quite apart from its cost. The second proposal was entertained by the Council so far as preparing estimates of the cost of issuing a series of 100 collotype plates, the actual size of the specimens, provided one hundred subscribers at a given rate were forthcoming, but as only seventeen subscribers offered, that project also fell through.

In order in some measure to meet the wishes expressed, the Council sanctioned the printing of a catalogue of generic names in the Linnean Herbarium in the original sequence, with the number of the sheets under each, followed by an alphabetical index, and preceded by an account of an enumeration by Linné himself of the plants possessed by him in 1755; advance copies were printed and distributed before the 23rd May, 1907, and reissued in the 'Proceedings' in October of that year.

INTRODUCTION.

Though the original project could not be carried out, it was not forgotten, and in 1911 it occurred to the compiler, that an index on a modest scale, showing by special type every plant authenticated by the author himself, or at his dictation, would be acceptable; the 'Index' was the result.

The Linnean sequence has been preserved in the herbarium as far as possible, and more than one hundred specimens which had been transferred by Smith to other genera have been replaced, so that the Linnean material is again brought together. As an instance, Smith removed 4 species from *Oldenlandia* to *Hedyotis*, thereby obscuring Linné's conception of the former genus. A few slight slips of the pen have been disregarded, but important variations of name have been noted. The zoological genera in the herbarium were not catalogued specifically until the MS. catalogue was prepared. The total number of sheets is as follows:—

Sheets of plants . . . . .	13,832
Zoological, as <i>Flustra</i> , etc. . . . .	99
Undetermined . . . . .	284
	<hr/>
Total . . . . .	14,215
	<hr/>





A view of the Linnean Herbarium at the present time. The doors are open, showing the twenty-one steel boxes which contain the parcels of plants: one box is open, showing the ends of the parcels, one of which is placed at the bottom. The doors have double steel sheets with asbestos between them, and the cabinet is lined throughout with the same fire-proof materials.

Before the recent war, the herbarium was kept in the three painted wooden cabinets used by Linnæus, and the cabinet had glazed doors, but the risk of damage by enemy aircraft caused the adoption of the changes above indicated.

## THE LINNEAN HERBARIUM.

THE Linnean herbarium itself is known at home and abroad to many botanists, who have consulted it, but to the modern systematist, accustomed to good specimens accompanied by full information on the collector's tickets, it may be disappointing. The paper is small,  $12\frac{1}{2}$  by 8 inches (32 cm.  $\times$  20.5 cm.), and the information when given is often meagre. Linné evidently trusted to a strong and retentive memory, so that his notes are very brief, or little more than arbitrary signs to remind him of the source of the specimen. The specimens are usually authenticated by a number, namely, that prefixed to the species in the first edition of the 'Species Plantarum' in 1753, followed by the specific or "trivial" name; the species added to his collection up to the 10th edition of his 'Systema Naturæ,' vol. ii. 1759, are shown by capital letters, in the case of *Hedysarum* extending from A to L. With the second edition of the 'Species Plantarum' in 1762-3, an entirely new series of numbering was used, and in the latest (12th) edition of the 'Systema Naturæ' in 1767, additions were numbered on, but put nearest to their allies, disregarding their numerical order; this enlarged numbering was not employed in the herbarium.

In small or moderately large genera, one cover suffices; at the bottom left-hand corner is the generic name written by Linné, but in the case of monotypic genera, the number "1" is often the only authentication on the species-sheets. I have in such cases printed the name as being non-existent, but have put (pl.) after it, to show that the type is there, though not verified under the hand of the author. Similarly, all names in *italic* type are names either not vouched for by Linné, or are absent from the collection; the names written by him are printed in ordinary Roman type; where the name has been written by an amanuensis, I have added (m. Sol.)=manu Solandri, or other assistant as the case may be. It is only where I am convinced by the special circumstances of each case, that I have allowed myself this licence. Thus, we have the distinct assurance from Sir J. E. Smith, that Solander wrote all the specific names to Patrick Browne's specimens (Linn. Corr. i. 43), and if corroboration be wanted, in the Linnean library there is a copy of Browne's 'History of Jamaica' with the Linnean trivial names written in the margin by Linné himself. Other amanuenses were Olof Söderberg, Gabriel Elmgren, J. P. Falk, Pehr Löfling, Erik Gustaf Lidbeck, Anders Dahl, and the younger Linné. As to the first and second, I am unable to assert that their writing is in the herbarium; but when the writer is, so far as I am concerned, uncertain, I have shown it by adding (m. am.)=manu amanuensis. The handwriting of the others is known, from some

of whom, *e.g.* Löffling, many letters are preserved in Linné's correspondence, and this valuable body of letters has been constantly appealed to for information or confirmation.

#### PLAN OF (1912) INDEX.

The method of framing the index was as follows. A list of all names of genera and species issued by Linné was drawn up, chiefly from Petermann's Index to Richter's 'Codex Linnæanus,' with some additions and corrections. The herbarium was then examined sheet by sheet, and the Linnean names marked against the list. Many manuscript and unpublished names have been found, and are distinguished by the affix (MS.); further, a fair number of species which were published in the 'Supplementum' of the younger Linné in 1781, have been marked as in (Suppl.). These last are of interest as making certain which species were described by the elder Linné, about 189 in all, for the book itself gives no clue as to authorship. I may remark parenthetically, that the manuscript of the 'Supplementum' sheds but little light upon this question, as the earlier part has been copied by another hand, and practically none of it remains in the handwriting of Linné.

#### EARLIER ENUMERATIONS.

The next step was to collate certain enumerations existing in Linné's writing.

1. An interleaved copy of 'Species Plantarum' ed. 1, 1753, in which the number before each species then possessed by Linné is underscored. This was copied by Jonas Dryander in or about 1785, when the Linnean and Banksian herbaria were collated (Proc. Linn. Soc. 1887-88, p. 28; Smith in Linn. Lachesis, pref. p. ix.). A transcript of this copy is also at Kew (Proc. Linn. Soc. 1906-7, p. 91). I found in the Linnean copy that the printed pages 849-856 inclusive had been cut out, the interleaves alone remaining; as the Banksian copy has no marks on the corresponding pages, it is clear that these pages were already missing when the Linnean books came into the possession of Smith.

2. A manuscript list described in the 'Proceedings' 1906-7, pp. 90-95: it was brought down to the spring of 1755, most of the marking being by dots prefixed.

3. A copy of the second volume of the twelfth edition of the 'Systema Naturæ,' 1767, the numbers of the species represented in the Linnean herbarium being underscored as in No. 1.

The collation of these three Linnean lists, with the actual noting from the herbarium as it now exists, permits of a few observations being made. Each of these lists is faulty; the third especially so, for such genera as *Althæa*, *Phlomis*, and *Pulmonaria* have escaped marking altogether; pages 408 and 409 have been



turned over together, so that three small genera and the first third of *Antirrhinum* have been missed, though the remainder of the latter has been duly marked; such omissions show that the marking was done from memory. *Trifolium comosum* is not in the herbarium now, and was not noted in 1753 nor 1767, but was so in 1755; in all probability the dot in the manuscript catalogue is an error, and the plant was at no time in Linné's possession.

#### CONTRIBUTORS TO THE HERBARIUM.

At the hundredth anniversary of this Society on 24th May, 1888, I gave an account so far as then ascertainable of the contributors to the Linnean herbarium (Proc. 1887-8, pp. 18-22). Since then fresh information has been obtained from Prof. T. M. Fries's 'Linné,' 1903, the early volumes (i.-vi.) of the correspondence of C. v. Linné (Bref och skrivelser) and my examination of the entire collection. The last word cannot be given as yet, but when the whole of the letters are printed, it will be easier to add to the present account, than it is now to give a complete presentation. The following may be considered as the chief contributors to the herbarium:—

AHLELÖF, JONAS JOACHIMSON (1717-1783), a pupil of Linné, afterwards rector of Frillesås.

ALLAMAND, FRÉDÉRIQUE (fl. 1770-86), born at Lausanne, graduated at Leyden in 1749, and communicated Surinam specimens from 1756 to 1771 and later.

ALLIONI, CARLO (1725-1804). Italian alpine plants.

ALSTRÖMER, Baron CLAS (1736-1794). Prof. T. M. Fries states that during his travels in Spain and the South of Europe, from 1760 to 1764, the Baron sent to Linné no fewer than 1550 dried plants, 250 sorts of seeds, 202 shells, 60 corals, and 94 fishes, with many living plants, bulbs and roots. These numbers rest upon the correspondence, as I do not find so many tickets or memoranda from him in the herbarium; some sheets are marked "A." Linné speaks of receiving "several packets, which he had partly collected himself and partly received from others"; possibly many were exchanged or given away.

AMMANN, JOHANN (1707-1741), born at Schaffhausen, died as Professor of Botany at St. Petersburg; during his short life, he corresponded and sent dried plants.

ANKARCRONA, Admiral THEODOR CHRISTOPHER, afterwards ennobled (1687-1750). With other plants communicated *Phaseolus radiatus* about the year 1742.

ARDUINO, PIETRO (1728-1805); sent many plants, which are usually marked "Ard." close to the base of the stem.

ARGILLANDER, ABRAHAM (1722-1800); communicated Swedish and Finnish plants.

- ASCANIUS, PEDER (1723-1803), a pupil of Linné, who devoted himself to zoology and mineralogy; his name is mentioned as a contributor to the *Centuria secunda* (*Am. Acad.* iv. 330).
- BÄCK, ABRAHAM (1713-1795), Linné's most intimate friend, from whom he received occasional gifts of plants.
- BELTER, SVEN (1713-1760), Chaplain to a Russian embassy; sent a few plants from Russia.
- BANKS, Sir JOSEPH (1743-1820); sent specimens of *Banksia*.
- BARNEDES, MIGUEL (d. 1771). Spanish plants. Alströmer, Hallman, and Lötfling were personally acquainted with him.
- BARRÈRE, PIERRE (1711-1755). European plants, chiefly from France.
- BARTRAM, JOHN (1699-1777). "King's botanist in America"; a few plants from the North United States; some through Dr. Alex. Garden.
- BASSI, FERDINANDO (1710?-1774), Prefect of the Bologna garden, whence he sent plants. Lasègue (*Mus. bot. Deless.* 359) states that Bassi and V. Donati sent Forsskål's Arabian plants to Linné, on what authority I know not, but as Donati died in 1762 and Forsskål in 1768, there is proof of a blunder.
- BASTER, JOB (1711-1775). A collection of plants from Java, more than 300 in all.
- BERGEN, CARL AUGUST VON (1704-1759), professor at Frankfurt-on-the-Oder.
- BERGIUS, PETER JONAS (1730-1790), a pupil of Linné, settled at Stockholm as an eminent physician; collected plants in Gotland; best known for his volume '*Descriptiones plantarum ex Capite Bonæ Spei*,' 1767.
- BERLIN, ANDERS (1746-1773). European plants, and some from Guinea, where he died.
- BIÖRLIN, M.; sent a specimen of *Globularia* from Natolia.
- BJELKE, Baron STEN CARL (1709-1753). Visited Russia in 1774, whence he sent MS. catalogues of plants from Russian collectors, and plants also.
- BLADH, PEHR JOHAN (1746-1816). Resident for some years at Canton; some Chinese and Cape plants in the herbarium possibly came through Thunberg.
- BLOM, CARL MAGNUS (1737-1815); cf. 'Bref och skrifv.' I. iii. 270. *Hydrangea arborescens*.
- BRAAD, CHRISTOPHER HENRIK (1721-1781); supercargo in the Swedish East India Company's service, who brought home plants from Surat and other Asiatic ports.
- BRANDER (afterwards SKJÖLDEBRAND), ERIK (1720-1814). Swedish consul at Algiers from 1753 to 1765; sent insects and a few plants from North Africa.
- BREYNE, JOHANN PHILLIPP (1680-1764). His contributions are mentioned in the '*Hortus Upsaliensis*.'

- BROWNE, PATRICK** (1720-1790). Born in Ireland, he practised as a doctor in the West Indies, and published in 1756 a folio volume on the Natural History of Jamaica; his herbarium was bought by Linné through Collinson in 1758 for £8 8s.; the purchaser marvelled that the English should let so fine a collection slip through their hands for "100 plâtar," that is, double what it cost Linné. The specimens are denoted by "Br." in Linné's hand, but the names were written by Solander at the extreme bottom of each sheet, presumably from the printed volume which Linné annotated, 347 being noted; cf. Smith, *Linn. Corr.* i. pp. 42-44.
- BURGESS, Rev. Dr. JOHN** (fl. 1771-1805), lichenologist at Kirk-michael, Dumfries.
- BURMAN, JAN** (1706-1779), eminent Dutch botanist; contributed Cape and Javan plants; father of
- BURMAN, NICOLAUS LAURENT** (1734-1793). Visited Uppsala in 1760, and afterwards was a frequent correspondent.
- "**CAPELL.**"=Capellanus, Chaplain; used by Linné for Frater Gabriel, of Aix.
- CATESBY, MARK** (1680-1749), author of the 'Natural History of Carolina,' etc.
- CELSIUS, OLOF**, the elder (1670-1756). Linné's early benefactor in his Uppsala student period. He returned to the botanic garden plants he had taken thence when the place lay in neglect.
- CLAYTON, JOHN** (1686 or 1693?-1773). Born in Middlesex, collected in Virginia, sent plants to Gronovius, who published his 'Flora Virginica' in 1739-43. Linné says:—"When I assisted Dr. Gronovius in examining plants from Virginia, I got duplicates of most of them." The labels to these are in the handwriting of Gronovius.
- CLIFFORD, GEORGE** (1685-1760). Linné's patron at Hartecampe, near Haarlem, who "had an excellent herbarium from which he gave me all the duplicates"; (see also 'Sp. Pl.' ed. 2. præf.). These are recognisable by their good thick paper, which has been cut down from the original size, 18"×11" (45.5 cm.×28 cm.) to the small size noted on p. 9. They amount to about 100 sheets, most of them still further marked, by portions of the printed vase at the base of the stem of the specimen, or the ticket at the left hand at the bottom, marks well known to those who have referred to Herb. Clifford. at the British Museum.
- COLLINSON, PETER** (1694-1768). Contributed plants from his garden; bought Browne's herbarium on behalf of Linné in 1758.
- CRONSTADT, Count CARL JOHAN** (1709-1779) [not "Jakob"].
- DAHL, ANDERS** (1751-1789). The records in the herbarium are probably only as an amanuensis; his names are on the back of each sheet, close to the bottom.

- DAHLBERG, *Colonel* CARL GUSTAF (fl. 1754-75). A Swede residing in Surinam; during a visit to his native country in 1754, he invited Rolander, then a promising pupil at Uppsala, to return with him. Plants were sent to Linné from Dahlberg, including those which came through the King (Gustaf III.), which were the last upon which Linné was able to do any botanic work; many were published in the 'Supplementum.'
- DALBERG, NILS (1736-1820), a brother of the last, though he spelled his name differently; a student at Uppsala, became eminent as a medical man, and enthusiastic naturalist.
- DALMAN, JOHAN FRÉDRIK (1726-1809). Sent some plants from India, the result of a voyage thither in 1748.
- DE GEER, *Count* CHARLES (1720-1778). Eminent entomologist; having assisted Rolander with funds for his South American journey, the latter on his return gave all his plants to De Geer, "who made me a present of every one of them." Not a single plant seems to have been given direct to Linné.
- DÉMIDOFF, *Prince* GRÉGOREY (fl. 1750-60). In a letter dated 15th May, 1750, he spoke of his collection of more than 800 plants sent to Linné for naming, with permission to retain duplicates. Amongst these came Steller's from Kamtschatka, Gerber's from Astrachan and the River Don, and Lerche's from Persia. The following March he thanked Linné for his work, and said that the Moscow plants were of his own gathering. Karamyschew regretted that all were not allowed to remain in Linné's possession (*Am. Acad.* vii. 447).
- DICK, JACOBUS (d. 1775), of Spiez, near Thun, Switzerland; a pupil of Haller, and friend of Jacquin. His herbarium was bought by Sir Joseph Banks. *Cf.* *Jacq. Hort. Vindob.* iii. 12; *Ep. ad Haller*, v. 141; 284-291. *Journ. Bot.* (1902) 389; (1904) 357-358; (1909) 272-273. This name is attached to a few plants in the herbarium, sent by Gessner in 1763, as collected by Dick and Fueslin in the Rætian Alps.
- DILLENIUS, JOHANN JAKOB (1687-1747). "Many from the garden at Oxford."
- DONATI, VITALIANO (1717-1762). Said to have sent Forsskål's Arabian plants to Linné, but the dates disprove this.
- DUCHESNE, ANTOINE NICHOLAS (1747-1827). Specimens of *Fragaria*, named.
- DU ROI, JOHANN PHILIPP (1741-1785). Plants from Brunswick, Hortus Harbecensis; Harbke, near Helmstedt; he was author of 'Die harbkeschische Baumzucht.' Braunschw. 1771-2; Ed. II. by J. F. Pott, *ib.* 1791-1800.
- EHRHART, FRIEDRICH (1736-1795). Many specimens named by him, especially amongst the cryptogams.
- EKEBERG, CARL GUSTAF (1716-1784); Captain of an Indiaman, who brought plants to Linné from tropical Asia.
- ELLIS, JOHN (1711-1776), a London merchant and friend of Peter Collinson; these two were Linné's most constant

English correspondents; Ellis sent American plants and specimens of *Corallina*.

ESCALLON, —. (fl. 1777). Plants sent through Mutis.

FABRICIUS, JOHAN CHRISTIAN (1745–1808). After studying two years at Uppsala, became Professor at Copenhagen and afterwards at Kiel; eminent as an entomologist, see Linné's remark quoted under Zoega. A few plants sent to Linné.

FAGRAEUS, JONAS THEODOR (1729–1797). Studied at Lund and Uppsala; afterwards custodian of Baron C. Alströmer's collections at Alingsås.

FALCK (OR FALK), JOHAN PEHR (1733–1734). Sent plants from Russia, also from Gotland.

FERBER, JOHAN JAKOB (1743–1790). Specimens sent during his travels in the South of Europe.

FEUILLÉE, LOUIS ECONCHES (1660–1732), French explorer: cf. *Physalis*, sheet 12.

FORSSKÅHL, JOHAN CHRISTIAN (1725–1756), brother of the following, in spite of the varied spelling; sent plants from Finland.

FORSSKÅL, PEHR (1735–1768). Plants from Germany; afterwards made collections of plants and animals in Egypt and Arabia, published by C. Niebuhr, the sole survivor of the expedition. Zoega wrote the text of '*Flora ægyptiaco-arabica*,' Havnæ, 1775.

FORSTER, JOHANN GEORG ADAM (1754–1794), son of the next named; accompanied his father on Cook's second circumnavigation; afterwards Professor at Wilna.

FORSTER, JOHANN REINHOLD (1729–1798). Naturalist on board the '*Resolution*,' with George Forster and A. Sparrman. Sundry plants were supplied to Linné from the Southern hemisphere.

FOTHERGILL, JOHN (1712–1780). Corresponded with Linné, and sent him both plants and animals.

FUESLIN (fl. 1770). Collected with J. DICK.

GABRIEL, *Frater* [*Baron DE LATOURDAIGNES?*] (fl. 1757–1768). Plants sent from Aix in Provence; the collector was a Capuchin friar: cf. Cotta, J., C. Gerber et M. Godefroy; Une lettre inédite de Linné au frère Gabriel, apothicaire des Capucins d'Aix.

GAHN, HENRIK (1747–1816). Specimens sent from England, where he was offered the chance of taking part in a voyage of exploration; his decision to decline the proposition seems to have annoyed Linné.

GARDEN, ALEXANDER (1730–1816). Plants, etc., from Carolina, principally through Collinson and John Ellis.

GERARD, LOUIS (1733–1819). Provençal plants.

GERBER, TRAUOGOTT (fl. 1739–1741), Prefect of the Moscow Medical Garden; drew up lists of plants observed near the rivers Volga and Døn, which lists were sent by Baron Bjelke to Linné, and some of the plants by Prince Démidoff.

- GESSNER, JOHANN (1709–1790), of Zürich, where he was professor of mathematics and physics, at the same time the friend and correspondent of Haller and Linné; Gessner communicated Dick's plants.
- GLEDITSCH, JOHANN GOTTLIEB (1714–1786). professor in Berlin.
- GMELIN, JOHANN GEORG (1709–1755). Spent 1733–1743 in Siberian exploration for the Russian Government; from 1749 professor in Tübingen. Linné's statement is:—"On Gmelin's return from Siberia, . . . he gave me a specimen of every plant he had collected, in order to learn my opinion of each." Steller was one of Gmelin's assistants.
- GORDON, JAMES (d. 1783), Nurseryman at Mile End, 1750–1776; sent living plants to Linné.
- GORTER, DAVID VAN (1717–1783). Became physician in the Russian service; sent plants from Russia.
- GOUAN, ANTOINE (1733–1821). Constant correspondent, sending material from Montpellier and its neighbourhood. His labels are extremely neat.
- GRONOVIVS, JAN FREDRIK (1690–1762). An early friend and supporter of Linné when in Leyden; sent Clayton's duplicates which came from Virginia.
- GUNNER, JOHAN ERNST (1718–1773), bishop of Trondhjem, and author of 'Flora norvegica'; a few marine algæ sent to Linné.
- GUSTAF III. (1746–92), King of Sweden; presented Surinam plants preserved in spirit: cf. Am. Acad. viii. 249–267, t. 5 (ed. 3). *Gustavia*, Linn. (Myrtaceæ).
- HAGER, JOHAN HENRIC (d. 1770), pupil under Linné at Uppsala, afterwards M.D. at Lund; supplied *Tussilago alba* from Småland.
- HAGSTRÖM, JOHAN OTTO (1716–1792). One of Linné's cleverest pupils; he wrote on bee-flowers.
- HALLER, ALBRECHT VON (1708–1777). Seems to have supplied a few specimens only.
- HALLMANN, DANIEL ZACHARIE (1722–1782). Specimens from Spain.
- HASSELQUIST, FREDRIK (1722–1752). Sent to Egypt and Palestine; died at Smyrna. Queen Lovisa Ulrika redeemed his collections, and Linné received specimens of each when there were three. Linné says:—"I have a specimen of every one of the plants found by Hasselquist in Anatolia, Egypt, and Palestine." This seems to be exaggerated, as the list I have taken out of the plants marked as collected by Hasselquist, falls far short of the number cited by Linné as observed by the traveller in 'Flora Palæstina' (Am. Acad. iv. 449–467).
- HEDENSTREIT, JOHANN ERNST (1702–1757). Plants from the East.
- HEINZELMANN, JOHANN GOTTFRIED (fl. 1732). Historiographer to the Russian government; recorded plants from Astrachan.

- HOLM, JÜRGEN TYGE (1726-59). Danish student and respondent under Linné; returned to Copenhagen and died the same year. Sent *Atriplex pedunculata* from Denmark.
- HOUSTON, WILLIAM (1695-1733). American plants received through P. Miller.
- HUDSON, WILLIAM (1730-1793). Author of the 'Flora anglica.'
- JACQUIN, Baron NICOLAUS JOSEPH VON (1727-1817). A valued correspondent; most of his tickets were pasted down by Linné. Plants from America, Austria, and many from gardens.
- JUSSEU, BERNARD DE (1699-1776). Seeds to Linné in large quantity for the Uppsala garden during many years; many plants reared from them, no doubt, are concealed under the initials H. U.=Hortus Upsaliensis: "he also gave me a great many dried specimens."
- KÄHLER, MARTIN (1728-1773). Chiefly plants from Italy; many are marked "Kh."
- KALM, PEHR (1715-1779). This pupil of Linné travelled from 1747 to 1749 in North America and Canada; he "collected a vast number . . . and gave me one of each." These specimens are marked "K."
- KLEYNHOEF, CHRISTIAEN (fl. 1761-65), "who formed the largest botanical garden in Java, and there raised a great many East Indian plants, on his return home to Holland, sent us a large trunk full." Some Japanese plants are also recorded from him.
- KÖNIG, JOHAN GERARD (1728-1785). Several hundreds of plants from Iceland and Southern India; the latter are labelled with the collector's own tickets, and sometimes annotated by the younger Linné.
- KRASCHENINNIKOW, STEPHAN PETROVIC (1713-1755). Siberian plants.
- KUHN, ADAM (1741-1817), pupil under Linné, afterwards Prof. of Medicine at Philadelphia; sent *Clinopodium incanum* from North America.
- LAGERSTRÖM, MAGNUS (d. 1759). Engaged in the East Indian trade; communicated some Asiatic rarities to Linné.
- LATOURETTE, MARC ANTOINE LOUIS CLARET DE (1729-1793). Many specimens noted as contributed by him.
- LAWSON, ISAAC (fl. 1734-1759). A Scottish graduate of Leyden, and a generous friend to Linné. D. Z. Hallman met him in London in 1759.
- LAXMANN, ERIC (1737-1796). A correspondent of Linné who sent Siberian plants.
- LECHE, JOHAN (1704-1764). A few sheets from his herbarium written up by him.
- LE MONNIER, LOUIS GUILLAUME (1717-99). French prof. botany; sent Pyrenaean plants.
- LERCHE, JOHAN JAKOB (1703-1780). Persian plants; some from Astrachan were received in 1735.

- LEYSER, FRIEDRICH WILHELM VON (1731-1815). Sent a few plants from Central Europe.
- LINNÉ, CARL VON (1707-1778). See separate account on p. 21.
- LINNÉ, CARL VON (1741-1783), son of the foregoing. Chiefly as amanuensis, and editor of the 'Supplementum.' Most of his own collections are incorporated with Smith's herbarium.
- LISTER, MARTIN (1638?-1712). Contributed *Lycopodium denticulatum* from Portugal.
- LÖFLING, PEHR (1729-1756). Amanuensis and favourite pupil; sent Spanish and Spanish American plants to Uppsala, most of which are marked "*Hispan. Löfl.*"
- LOUREIRO, JUAN (1715-1796). Plants from Cochinchina; afterwards brought out his 'Flora cochinchinensis,' 1790.
- LUDWIG, CHRISTIAN GOTTLIEB (1709-1773), professor in Leipzig.
- MAGNOL, PIERRE (1638-1715). His herbarium was bought by Sauvages, and presented to Linné; most of the specimens are marked "M" close to the base of the plant, sometimes also "*Monsp.*" Linné's statement is, "Professor Sauvages had received from Magnol (the great botanist) his entire herbarium, which Sauvages made me a present of."
- MARTIN, ANTON ROLANDSSON (1729-1786). Spitzbergen.
- MASSON, FRANCIS (1741-1805). A few plants from the Cape.
- MILLER, PHILIP (1691-1771). "Miller of Chelsea permitted me to collect many in the garden, and gave me several dried specimens, collected by Houston in South America."
- MINUART, JUAN (1673-1768). Spanish plants; he was a friend of Löfling.
- MITCHELL, JOHN (d. 1768), resident in Virginia from 1700 to 1748, when he returned to England.
- MONTI, GIUSEPPE (1682-1760), professor of botany at Bologna.
- MONTIN, LARS (1723-1785), pupil of Linné: travelled in 1749 in Lule Lappmark for plants; uncle of J. Dryander, Linné's pupil.
- MÜNCHHAUSEN, OTTO, *Freiherr* VON (1716-1774). North German plants.
- MURRAY, ADOLF (1751-1803), a favourite pupil of Linné, though amongst the younger students; sent plants from Padua to Linné.
- MUTIS, JOSÉ CELESTINO (1732-1808), resident in New Grenada (Colombia); his second collection arrived when Linné was too ill to examine them, so that the younger Linné described them in the 'Supplementum' and placed them in the herbarium with his written names. Escallon's plants were sent by Mutis. See Smith, *Corr. Linn.* ii. pp. 532, 537.
- MYGIND, FRANDS, afterwards FRANTZ VON (1710-1789). Many Austrian plants are marked as from him.
- NIETZEL, DIETERICH (1703-56). German gardener employed at Hartecamp, and from 1741 to his death, at Uppsala; cf. *Gard. Chron.* III. lvii. (1915) 353.
- NORDBERG, —. The name occurs in the 'Supplementum,' p. 265, as the sender of specimens of the nutmeg tree from Banda.



- OEDER, GEORG CHRISTIAN (1728-1791), the first editor of the 'Flora danica.'
- OLDENLAND, HENRIK BERNARD (d. 1761). Cape plants collected about 1760; given to Linné by J. Burman.
- ORTEGA, JOSÉ (d. 1761). Spanish plants; a friend of Löffling during his two years' stay in Spain.
- OSBECK, PEHR (1723-1805). Travelled to Canton as ship's chaplain; his plants are marked in the herbarium with O, or more frequently on the back with the name in full, as "Habitat in China. Osbeck"; about 600 plants from China.
- PALLAS, PETER SIMON (1741-1811). The distinguished traveller in Russia, who was born and died in Berlin.
- PONTIN, DAVID DAVIDSON (1733-1809). A cousin of Hasselquist; transmitted plants from Malabar.
- POTT, JOHANN FRIEDRICH (1738-1805), physician to the Duke of Brunswick; sent a few plants; see also under Du Roi.
- RATHGEB, JOSEPH VON (fl. 1744). Austrian Minister at Venice, who sent Italian plants to Linné.
- RICHARD, LOUIS CLAUDE MARIE (1754-1821). Mentioned in the 'Mantissa' as a contributor.
- ROLANDER, DANIEL (1725-1793). One of Linné's pupils, who went to Surinam, but on his return to Sweden gave all his plants to Count de Geer, to Linné's great disgust at the "ungrateful Rolander."
- ROSÉN (afterwards ROSENBLAD), EBERHARD (1714-1796); professor at Lund, and younger brother of Linné's colleague Nils Rosén (von Rosenstein). Plants from Skåne.
- RÜTBÖLL, CHRISTEN FRIIS (1727-97), pupil of Linné, then professor of medicine and botany at Copenhagen; sent Cyperaceæ, etc. 1771-75); styled 'Friis' in his herbarium by Linné.
- ROYEN, ADRIAAN VAN (1705-1779). "On my assisting Van Royen to arrange the garden belonging to the University of Leyden, I obtained not only a large number of recent plants, but also many dried ones."
- ROYEN, DAVID VAN (d. 1799), professor in Leyden.
- SAHLBERG, JOHAN (1741-1810). A few Swedish plants.
- SAUVAGES, FRANÇOIS BOISSIER DE LA CROIX DE (1706-1767). Linné's most valued correspondent abroad; he contributed plants from the south of France, and also Magnol's herbarium; many specimens are labelled by him.
- SCHREBER, JOHANN CHRISTIAN DANIEL (1739-1810), an eminent pupil of Linné.
- SCHMIDEL, CASIMIR CHRISTOPH (1718-1792).
- SCOPOLI, JOHANN ANTON (1723-1788). Author of 'Flora Carniolica,' etc.; plants from south-eastern Europe.
- SEGUIER, JEAN FRANÇOIS (1703-1784). Chiefly alpine plants from Monte Baldo near Verona.
- SIBTHORP, HUMPHREY (1713?-1797), professor of botany at Oxford.

- SOLANDER, DANIEL (1733-1782). Next to Löfving, esteemed by Linné as his favourite pupil; plants from Pite Lappmark and England; wrote up Browne's Jamaica plants in the herbarium in 1759, and shortly afterwards left Sweden for London; never returned to his native land. See Biography in Banks's 'Journal,' edited by Sir Joseph Hooker, London, 1896, pp. xxxviii-xlii, with portrait by John Zoffany.
- SONNERAT, PIERRE (1749-1814), celebrated traveller in Tropical Asia.
- SPARRMAN, ANDERS (1748-1820). Another of Linné's noted pupils. He travelled to China (Canton), and published his travels, first as a thesis, and afterwards in a volume. Whilst staying at the Cape he was induced to join the Forsters in Cook's second voyage, on board the 'Resolution' in 1772, returning with them to the Cape in 1775 and coming home later. Numerous specimens in the herbarium, marked "Sp."
- STELLER, GEORG WILHELM (1709-1746). Assistant to Gmelin in the Siberian investigations; travelled to Kamtschatka, and crossed to North America; he died at Tiumen on his return homewards. His collections were bought by Demidoff and some were given to Linné; about thirty of his plants are in the herbarium.
- SWARIZ, OLOF (1760-1818). The specimens are chiefly lichens, ticketed with extreme care, and usually marked "Sz." or "O.S."; probably incorporated by the younger Linné.
- TERNSTRÖM, CHRISTOPHER (1703-1746). Travelled to India for natural history purposes, and died at Pulo-Condor.
- THOUIN, ANDRÉ (1747-1824), a munificent donor of dried specimens, chiefly to the younger Linné when in Paris.
- THUNBERG, CARL PETER (1743-1828). Traveller to the Cape, Ceylon and Japan; successor to the younger Linné in the Chair at Uppsala. His plants are marked "T" with a number referring to some MS. catalogue.
- TORÉN, OLOF (d. 1753). A ship's chaplain, and contemporary of Osbeck; visited Surat and Malabar; cf. Osbeck 'Dagbok' 316 (1757).
- TULBAGH, C. RIJK (d. 1771). Dutch Governor of the Cape, who made Linné "a present of above 200 of the rarest plants that grow there, all put up with great care, besides a number of roots and bulbs alive, for the purpose of being planted in the garden."
- TURRA, ANTONIO (1730-1796), professor at Vicenza. Sent Italian plants.
- TUVÉN, ERIK (fl. 1754). Sent *Orchis sambucina* to Linné from near Stockholm, the first record in Sweden.
- VANDELLI, DOMINGOS (fl. 1768-1789), professor in Lisbon. Sent Portuguese plants, and some from the Colonies.
- VELEZ, CRISTÓBAL (d. 1753), a friend of Löfving. Sent Spanish plants to Linné; his collection passed into the hands of Quer.
- WACHENDORF, EVERHARD JACOB VAN (1702-1758), of Utrecht, where he was Professor.

- WAGNER, JOHANNES GERHARD (1706–1759). His contributions are noted in the ‘Hortus Upsaliensis.’
- WÄNSTRÖM (or WENSTRÖM), S. M. Named in connection with two North African plants.
- WEIGEL, CHRISTIAN EIKENFRIED (1748–1831). Plants from Greifswald.
- WILCKE, SAMUEL GUSTAV [?] (fl. 1760–1765; d. 1791).
- WULFEN, FRANZ XAVER, *Freiherr* VON (1728–1805). Professor at Klagenfurt; sent Austrian plants.
- ZINN, JOHANN GOTTFRIED (1727–1759). Named as a contributor of plants, in the preface to the second edition of the ‘Species Plantarum.’
- ZOEGA, JOHAN (1742–1797). A Danish pupil highly esteemed by Linné: “If Fabricius brings me an insect, or Zoega a moss, I take off my hat and say, ‘Ye are my teachers,’” Fries, “Linné,” ii. Bil. xviii. 9.

The citations in the foregoing are mainly from Linné’s own autobiography in the ‘Egenhändigade anteckningar,’ edited by Adam Afzelius in 1823; in the words of a translation from the manuscript printed in Maton’s edition of Pulteney’s ‘Linnæus’ in 1805, pp. 543–547, and condensed in Proc. Linn. Soc. 1887–88, pp. 20–22; see the Bibliography appended (p. 25).

#### LINNÉ AS A COLLECTOR.

Thus far we have considered the contribution to the herbarium; the next question is, how far did Linné himself collect specimens? His own statements are these:—“I have collected, from my infancy, all the plants of Sweden, together with those of the Swedish gardens” (Maton’s ed. of Pulteney’s ‘Linnæus,’ p. 574), but the following, copied from p. 515 of the same work, is somewhat discrepant; it describes him becoming acquainted with dried plants only, while living with Dr. K. Stobæus at Lund in 1727. “He was highly delighted with the mode of making a hortus siccus, and immediately began to collect all the plants that grew in the neighbourhood of Lund, and to glue them on paper.” After deserting Lund for Uppsala, in the spring of 1729, he told Prof. Olof Celsius that he “had above 600 indigenous plants preserved in his cabinet.” From hints in his works, and from indications in his herbarium, he seems to have collected at various times, such as his Lapland journey: when at Tuggenforsen in Lycksele Lappmark he gathered and named for the first time the *Linnaea borealis*, on 29th May, 1732, though the genus is stated to be of Gronovius upon a scrap which he gave his friend in 1735. His three journeys to Öland and Gotland, West Gotland, and Skåne, produced additions; but many plants are those gathered in the Uppsala Garden, the produce of those innumerable packets of seeds, sent year after year to him, from a more genial climate, and now recognisable in the herbarium under the initials H. U., *i. e.* Hortus Upsaliensis.

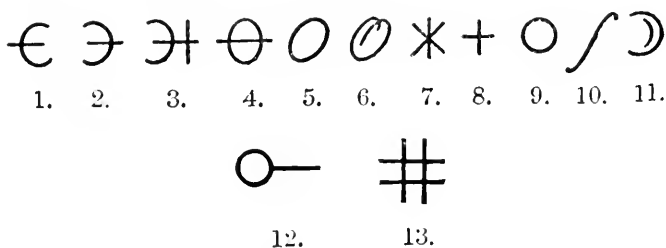
The younger Hartman mentions with evident surprise that so many Swedish plants should be absent from the collection, and in some cases the native plant is represented only by a specimen from a foreign country.

It can never be too emphatically stated, that it would be unjust to judge Linné's methods by modern ones, to condemn the pioneer because he could not foresee the latest developments, and to hold his collections cheap because the specimens are small and too often imperfect. The difficulties of travelling and sending specimens in those days quite sufficiently account for these imperfections.

#### SIGNS EMPLOYED.

The herbarium itself has been so often described in the memoirs mentioned in the bibliography, that a detailed account is not wanted here. Besides the small size, both of paper and the actual specimens, a modern observer is struck with the want of information as to the collector, place, and time of receipt. Linné, it is certain, trusted to his memory, using abbreviations and arbitrary signs to remind him, should occasion require, of the circumstances under which he acquired the specimens. Some of these signs offer no difficulty, such as K for Kalm; others have been held as more doubtful, as Sp. for Sparrman, which is correct. The younger Hartman was puzzled by the use of the sign  $\nabla$ , the Greek capital delta reversed, but Linné was accustomed to use many of these, which were usual among medical men of his time. This particular sign means *aqua*, easily guessed from *Agrostis stolonifera*  $\nabla$ : *tica* (Hartman, p. 25) or *Veronica Anagall.*  $\nabla$  (Sp. Pl. ed. 1, p. 12), the latter when written out being *Veronica Anagallis-aquatica*, this pre-Linnean name appearing in the synonymy. *Scandia Pecten* ♀ (Sp. Pl. ed. 1, p. 256) is now invariably written in full as *Scandia Pecten-Veneris*, the ♀ being the astronomical sign used for the planet Venus, as well as by the mineralogist for copper. A long catalogue might be compiled of Linné's signs in his various works, though as he used the same sign at times with different meanings, it need not be pursued further.

But ever since the herbarium came into the possession of the Society, three signs stand out as especially enigmatic, they are numbers 1, 2 and 4 in the following:—



Hartman in his preface says:—"One of these signs very often occurs, either with a specific name or alone, what their meaning is, has not yet been made out; by comparison they seem neither to indicate localities, person's names, the duration of the plants, annual, biennial, perennial or the like," but he also points out that No. 2 above is confined to Siberian plants. My own first reference to the herbarium, in August 1874, made me ask Mr. Kippist, the then Librarian, what the sign (No. 4) meant, and he owned that he did not know, nor did anyone else.

The latest guess was that made a few years ago by Pastor Enander; his view is:—that they are certainly Russian letters, and thus may be regarded as pointing to J. P. Falck, born in Westgotland in the year 1732 or 1733, professor at the Medical College in St. Petersburg, with whom Linné stood in close relation (*Salices*, p. 11). Now although the sign No. 4 may be taken as the Greek  $\Theta$ , it cannot stand for  $\phi$ , and No. 1 resembles no current Russian letter whatever. This speculation therefore does not help us.

This tantalizing uncertainty therefore was a subsidiary point that I set myself on beginning my investigation of the herbarium to find out, where possible, what these puzzling memoranda meant. I therefore copied them each time they occurred, and at the end, I had lists of plants bearing the cryptic signs. By comparison of the whole material thus obtained, I was able to set out the meaning of most of the signs occurring, thus:—

- No. 1. Collected by Gerber, principally in the district of the river Don or Astrachan.
- No. 2. From Siberia, communicated by Gmelin.
- No. 3. From Kamtschatka, collected by Steller.
- No. 4. Hasselquist's plants, as also No. 6.
- No. 5. Almost certainly Osbeck; see No. 9.
- No. 6. Hasselquist, the sign appears to be derived from "Habitat in Oriente." I have tried to discover if there was any reason why two signs for one collector were employed, but so far fruitlessly.
- No. 7. Unknown; applied to *Bellis annua*, a *Sisymbrium*, a *Trigonella*, and an unnamed specimen of *Conferva*.
- No. 8 is used as meaning "aristate," and
- No. 9 for "muticous," but the terms seem sometimes loosely applied, and in one case misapplied; the latter sign is also confused with Osbeck, and with  $\odot$  for annual.
- No. 10. May be a long S, and stand for "suecia"; a cross-stroke is sometimes present; Linné often used a small initial, as "stockholm."
- No. 11. Occurs in relation to *Anthericum calyculatum*, *Ornithogalum minimum*, *Salix rosmarinifolia*, and *Sisymbrium altissimum*. With regard to the third, Enander prints the sign as  $\mathfrak{D}$ , which means silver to the mineralogist, and may refer to a silvery appearance of the specimen.

No. 12. P. J. Bladh's plants.

No. 13. Cristate, e. g. *Erica cordifolia*; cf. Nos. 8 & 9.

#### NUMBERS EMPLOYED.

The system of numbering adopted by Linné must be mentioned. The numbers found in the herbarium, either alone, or in association with a specific name, refer to the numbers given in the original edition of the 'Species Plantarum' in 1753; additional species were lettered in capitals and intercalated in their appropriate place: thus *Hedysarum* in the 10th edition of the 'Systema' has no fewer than twelve, A to L inclusive. In the second edition of the 'Species' 1762-3, an entirely new numbering was carried through, and in the 12th edition of the 'Systema' 1767, additions were numbered in sequence with the 'Species' numbers, but put into their affinity, regardless of numerical order; this emended set was not applied to the herbarium. After this date, such numbers were abandoned. Numbers are also found referring to lists sent with plants, the 'Flora lapponica,' etc.

#### DAMAGE TO HERBARIUM BEFORE 1783.

The herbarium suffered risks and actual damage before it came into the hands of Smith in 1784. We have an account by Beckmann, the author of the 'Century of Inventions,' that on 30th April, 1766, a fire broke out in Uppsala during a fierce gale and destroyed a large part of the town. Linné had his herbarium and library removed to a barn outside the town, but the risk to which it was exposed led him to build his little museum at Hammarby, some distance from the house, and without a fireplace. This in its turn produced the opposite evils of damp and mould; the younger Linné complained of the terrible damage done by mice, mould and insects, and at the first opportunity, he removed the collections once more into the town. Linné left a memoranda begging that the herbarium should be kept from harm by mice or moths, that no naturalists should have a single specimen—valuable by itself, it would acquire added value by age, and he then gave the probable value of the various parts of his collections. But a loss had already taken place before the death of its possessor; the son in a letter of 1779 to Archiater Bäck, says:—"My late father weeded out his herbarium, while he was able to work, and seems to have burned all the duplicates, why, no one knows" (Fries, Linné, ii. p. 416, note). The terrible damage by mice is not now perceptible, for I only noticed two sheets which had been gnawed besides three of the undetermined; the son must have withdrawn the damaged sheets, and amongst these may have been those I have had to note as missing, such as *Cupania* and *Sarracenia*.

## COLLATERAL TYPE-COLLECTIONS.

There are other collections which may be looked upon as containing types of Linné's species, especially when his own herbarium is wanting in them, or they were acquired after the descriptions were published. The Martin-Burser herbarium at Uppsala is a case in point; in the *Am. Acad.* i. pp. 141-171 will be found descriptions of 250 plants, with Linnean names to fit those according to Caspar Bauhin's 'Pinax,' and several of them seem never to have been represented in Linné's herbarium at any time, such as *Poa Eragrostis*, *Anthoxanthum paniculatum*, *Allium spherocephalum*, *Senecio incanus* and *Ceanothe crocata*. Clifford's herbarium is now at the British Museum, having been bought by Banks, and is valued, as showing the originals of Linné's descriptions in his 'Hortus Cliffortianus.' Then, too, it is certain that he described many species of *Lichen* in the broad sense, from the Dillenian herbarium at Oxford. In the preface to the 'Species Plantarum,' ed. 2, we find him specifying the gardens which he has gone through: Paris, Oxford, Chelsea, Hartecamp, Leyden, Utrecht, Amsterdam, Uppsala and others. From these he may have had a good supply of specimens, but very few of the list of herbaria following could have afforded so liberal a supply; Burser, Herman, Clifford, Burman, Oldenland (in Burman's possession), Gronovius, Roijen, Sloane, Sherard, Bobart, Miller, Tournefort, Vaillant, Jussieu, Surian (St. Domingo plants in Jussieu's herbarium), Bäck, and Browne. Anything in these of special note must almost certainly have been described from those specimens.

In the year 1760 the younger Burman visited Linné at Uppsala, bringing with him his father's large collection of Cape plants, in which department the Dutch were supreme; many amongst these were new to science, and formed the types of such as were described by Linné on this occasion.

## BIBLIOGRAPHY.

In the following bibliography I have given my authorities for the statements made above with regard to the Linnean herbarium; its growth, and subsequent history. Although I have arranged the titles of the various theses according to the dates when they were sustained, yet for the sake of convenience in citation I have confined my references to Schreber's edition of the 'Amœnitates Academicæ,' Erlangæ, 1787-90, 10 vols. 8vo. I have not cited the 'Flora Svecica,' ed. 2, Stockholm 1755, throughout, for although I extracted nearly 30 additional names, I cannot assert that plants were sent to Linné as vouchers, or to add to his collection.

1745. *Plantæ Martino-Burserianæ*; *resp.* R. Martin. (*Am. Acad.* i. 141-171.)  
 — *Hortus Upsaliensis*, *resp.* S. Naucner. (*Am. Acad.* i. 197, 198.)

1748. Hortus Upsaliensis, tom. i. (et unic.) præf. p. [2].
1750. Plantæ Camtschaticenses rariores, *resp.* J. P. Halenius. (Am. Acad. ii. 336-363.)
1751. Nova Plantarum genera, *resp.* L. J. Chenou. (Am. Acad. iii. 8-25.)
1753. Species Plantarum, præf. p. 4 [-5].
1755. Centuria prima plantarum, *resp.* A. J. Juslenius. (Am. Acad. iv. 261-296.)
1756. Centuria secunda plantarum, *resp.* E. Torner. (Am. Acad. iv. 297-332.)
- Flora palaestina, *resp.* B. J. Strand. (Am. Acad. iv. 441-467.)
1757. Buxbaumia. *Resp.* A. R. Martin. (Am. Acad. v. 78-91.)
1758. Systema Naturæ. Ed. X. Vol. i. præf. p. [2].
1759. Flora capensis. *Resp.* C. H. Wäinman. (Am. Acad. v. 356, 358.)
- Flora jamaicensis. *Resp.* C. G. Sandmark. (Am. Acad. v. 371-388.)
- Pugillus jamaicensium plantarum. *Resp.* G. Elmgren. (Am. Acad. v. 389-413.)
1762. Species Plantarum. Ed. 2, præf. f. 4 verso, 5.
1766. Necessitas historiae naturalis Rossiae. *Resp.* A. de Karamyschew. (Am. Acad. vii. 438-460; Fl. sibirica, *ib.* 460-465.)
1767. Systema Naturæ. Ed. XII. Vol. i. præf. p. [2].
- Mantissa plantarum . . . . 1-142 (2).
1768. Iter in Chinam. *Resp.* A. Sparrman. (Am. Acad. vii. 497-506.)
1771. Mantissa plantarum altera . . . . (4) 143-588.
1774. Planta Cimicifuga. *Resp.* J. Hornborg. (Am. Acad. viii. 193-204.)
1775. Plantae surinamenses. *Resp.* J. Alm. (Am. Acad. viii. 249-267.)
1781. Supplementum plantarum . . . . editum a C. a Linné. Brunsvigæ. [The species of the elder Linné are now ascertainable, being marked in the 'Index.']
1805. [Autobiography.] English version in R. Pulteney: A General View of the Writings of Linnæus, second edition . . . . by W. G. Maton, to which is annexed the Diary of Linnæus, written by himself, and now translated into English, from the Swedish manuscript in the possession of the editor. London, 1805. 4to. Pp. 507-578, and genealogical table.  
[The Swedish original was printed in 'Egenhändiga afteckningar af Carl Linnæus om sig sjelf,' printed by A. Afzelius at Stockholm, 1823. 4to.]



1821. A selection of the Correspondence of Linnæus, and other naturalists, from the original manuscripts. By Sir James Edward Smith. London, 1821. 2 vols., 8vo.
1885. ÄHRLING, EWALD. Om Karl von Linné, Linné d. y., Linnean Society of London, Linnéska Institutet, Linnéska Samfundet, och Linnéska samlingarna. (Afttryck ur Nordisk Familjebok.) Stockholm, 1885. 13 pp. 8vo.
- [1903]. LINNÉ. Lefnadsteckning af Th. M. Fries. Stockholm [1903]. 2 vols., 8vo.  
[The special portion referring to the Collections and their disposal will be found in Vol. ii. pp. 413-429.]
1907. Bref och skrivelser af och till Carl von Linné; med understöd af Svenska staten, utgifna af Upsala universitet och med upplysande noter försedda af Th. M. Fries. Stockholm, 1907 (-1912).  
[In progress; seven volumes or parts have appeared to 1921. The letters are printed in the original language in which they were written; the explanatory notes are invaluable.]
- 
1825. Fortsetzung des Auszuges aus einem Schreiben . . . von J. A. Schultes. Flora, viii. (1825), 1er Beil. 3-8.  
— Transl. as 'Schultes's Botanical visit to England,' Hooker's Botanical Miscellany, i. (1830) [1829-30], pp. 48-53; reprinted as 'On the cultivation of Botany in England,' Phil. Mag. vi. (Nov. 1829), pp. 351-355.  
[Contains an account of a visit to Sir J. E. Smith, and of the Linnean herbarium in 1824.]
1832. Memoir and Correspondence of the late Sir James Edward Smith . . . edited by [Pleasance] Lady Smith. London, 1832. 2 vols., 8vo.  
[The letters which passed on the purchase of the Linnean herbarium in 1783-4 will be found in Vol. i. pp. 91-134.]
1840. GRAY, ASA. Notices of European Herbaria, particularly those most interesting to the North American botanist. Am. Journ. Sc. xl. (1840) 1-9.
1843. NEWMAN, EDWARD. Observations on the Linnean specimens of *Equisetum*. (From the 'Phytologist' [i. 1843], p. 530.) In: History of British Ferns [Ed. 2], pp. 412-415. Lond. 1843. Transl. Duval-Jouve, Joseph; in Histoire naturelle des *Equisetum* de France, pp. 228-230. Paris, 1864.
1845. LASÈGUE, ANTOINE. Herbar de Linné. In: Musée Bot. de M. Benjamin Delessert, pp. 349-359.

1845. PARLATORE, FILIPPO. *Flora palermitana* . . . Vol. i. 8vo. Firenze 1845 [-47], xxii+442. [References to the Linnean herbarium "ex ejus herbario" throughout the volume; see also preface p. viii.]
- 1850-53. HARTMAN, CARL. *Anteckningar vid de Skandinaviska växterna i Linnés Herbarium*. *Handl. K. Sv. Vet.-Akad.* Stockholm, 1849 (1850) 145-193; *ib.* 1851 (1853) 211-426.
1861. MUNRO, WILLIAM. On the identification of the Grasses of Linnæus's Herbarium, now in possession of the Linnean Society of London. *Journ. Linn. Soc., Bot.* vi. (1861) 33-55.
1862. FRIES, THEODOR MAGNUS. *Anteckningar rörande en i Paris befintlig Linneansk växtsanling*. Stockholm, Öfv. k. Vet.-Akad. Förh. xviii. (1861) 255-272.
1863. ANDERSON, THOMAS. On the identification of the Acanthaceæ of the Linnean Herbarium, in the possession of the Linnean Society of London. *Journ. Linn. Soc., Bot.* vii. (1863) 111-118.
1866. LORÉ, HENRI. *De l'herbier connu sous le nom d'herbier Magnol*. [Attributed by internal evidence to the younger Antoine Magnol, and a portion to Claude Chaptal.] *Bull. Soc. Bot. Fr.* xiii. (1866), 101-106.
1866. DUVAL-JOUVE, JOSEPH. *L'herbier de Linné et les graminées françaises, d'après les travaux de MM. Parlatore, C. Hartman et W. Munro*. *Bull. Soc. Bot. Fr.* xiii. (1886) 106-135.
1869. SCHIMPER, WILHELM PHILIPP. *Synonymia Muscorum Herbarii Linneani apud Societatem Linnæanam Londinensem asservati*. *Journ. Linn. Soc., Bot.* xi. (1869) 246-252.
1883. ROLFE, ROBERT ALLEN. On the Selagineæ described by Linnæus, Bergius, Linnæus *fil.*, and Thunberg. *Journ. Linn. Soc., Bot.* xx. (1883) 338-358.
1885. MASTERS, MAXWELL TYLDEN. *Restiacearum in Herb. Linnæi asservatarum catalogus*. *Journ. Linn. Soc., Bot.* xxi. (1885) 590-591.
1886. BAKER, JOHN GILBERT. On the *Narcissi* of the Linnean herbarium. *Gard. Chron.* xxv. (1886) 489.
1888. JACKSON, BENJAMIN DAYDON. *History of the Linnean Collections, prepared for the Centenary Anniversary of the Linnean Society*. (*Proc. Linn. Soc.* 1887-88, pp. 18-34.)
1903. — On Linnean specimens presented to Sir Joseph Banks in 1785. (*Proc. Linn. Soc.* 1902-3, p. 10.)

1907. JACKSON, B. D. On a Manuscript list of the Linnean Herbarium in the handwriting of Carl von Linné, presumably compiled in the year 1755 . . . to which is appended a Catalogue of the Genera in the Herbarium, with the numbers of the sheets of specimens. Prepared for the Anniversary Meeting of the Linnean Society of London, 24th May, 1907. in celebration of the 200th Anniversary of the birth of Carl von Linné. (Proc. Linn. Soc. 1906-7, pp. 89-126.)
1907. — Index to the Linnean Herbarium, within indication of the Types of Species marked by Carl von Linné. (Proc. 1911-12 (1912) Suppl. pp. 1-152.)
- Catalogue of the Linnean Specimens of Amphibia, Insecta, and Testacea noted by Carl von Linné. Transcribed and codified. (Proc. 1912-13 (1913) Suppl. pp. 1-48.)
- Correspondence between Carl von Linné and C. Rijk Tulbagh, Governor of the Dutch Colony of the Cape of Good Hope. Including a List of 203 specimens sent in or about the year 1767 to Upsala. (Proc. 1917-18 (1918) Suppl. pp. 1-13.)
- Notes on a Catalogue of the Linnean Herbarium. 1922.
1888. WAINIO, EDVARD AUGUST. Revisio lichenum in herbario Linnæi asservatorum. Medd. Soc. Fauna et Flora fennica, xiv. 1886 (1888) 1-10.
1894. CLARKE, CHARLES BARON. On certain authentic Cyperaceæ of Linnæus. Journ. Linn. Soc., Bot. xxx. (1894) 299-315.
1899. BRIQUET, JOHN. Notes sur quelques Baplèvres de l'herbier de Linné. Bull. Soc. Bot. Fr. xlvi. (1889) 289-291.
1907. ENANDER, SVEN JOHAN. Studier öfver *Salices* i Linnés herbarium. (In: Inbjudning till Theologie Doktors Promotionen . . . den 24 Maj, 1907.) Uppsala, 1907, 1-138, t. 2.
1907. LINDMAN, C[ARL] A[XEL] M[AGNUS]. A Linnean Herbarium in the Natural History Museum in Stockholm. I. Arkiv för botanik, vii. 1908, No. 3, 57 pp.
1907. MARSHALL, EDWARD SHEARBURN. *Carex* and *Epilobium* in the Linnean herbarium. Journ. Bot. xlv. (1907) 363-368.
1908. HITCHCOCK, ALBERT SPEAR. The American grasses described by Linnæus. Contrib. Nat. Herb. Washington, xii. (1908) 114-127.

1910. LINDMAN, C[ARL] A[XEL] M[AGNUS]. A Linnean Herbarium in the Natural History Museum in Stockholm. II. Arkiv för botanik, ix. 1910, No. 6, 50 pp.  
 Note the introductory portion, pp. 1-18, of the first part, where the respective herbaria of the younger Linné, Alströmer, and Montin are set forth.
1911. BECKMANN, JOHANNES. J. B.'s Schwedische Reise in den Jahren 1765-1766. Tagebuch . . . . . herausgegeben von Th. M. Fries. Upsala, 1911. Svo. (Pp. 96-99.)
1912. HOWE, REGINALD HEBER, JUNIOR. The Lichens of the Linnean Herbarium with remarks on Acharian material. Bull. Torrey Bot. Club, xxxix. (1912) 199-203.
1912. PIPER, CHARLES VANCOUVER. On the identity of *Dolichos unguiculatus* Linnæus. Torrey, xii. (1912) 189-190.
1913. LISTER, GULIELMA. Notes on the Mycetozoa of Linnæus. Journ. Bot. li. (1913) 160-164.
1913. PRAIN, Sir DAVID. The South African species of *Claytia*. Kew. Bull. Misc. Inf. 1913, 373-416.
1920. BROWN, NICHOLAS EDWARD. A new species of *Lobos-ton* [*L. magnisepalum*] in the Linnean herbarium. Journ. Linn. Soc., Bot. xlv. (1920) 141, 142.
1921. KRONFELD, ERNST MORIZ. Jacquin des Jüngerer botanische Studienreise 1788-1790. Aus den unveröffentlichten Briefe herausgegeben. Beihefte z. Bot. Centralbl., Orig. Arb. xxxviii. (1913) 132-176.

EXPLANATION OF THE ABBREVIATIONS AND SIGNS  
 USED IN THE PAGES OF THE (1912) 'INDEX.'

Specific names printed in Roman type, as "fastuosa," show that a plant is so termed in the herbarium by Linné himself; if by an amanuensis and clearly under Linné's direction, that is indicated by the addition in parentheses of the name of the amanuensis, as, for instance, under *ACALYPHA virgata* (m. Sol.)=manu Solandri, or the name on the sheet being in the handwriting of D. Solander, or (m. L. f.) where the handwriting is that of the younger Linné.

Specific names in *italic* type show that there is no specimen so named by Linné, but in cases where there can be no doubt as to the actual plant, I have added (pl.). Thus *ABRUS precatorius* is the only species, and is represented by a specimen, but does not show the name as written by Linné; sometimes the number from the 'Species Plantarum,' ed. I. is put, but although there can be, in monotypic genera especially, no doubt as to the authenticity of such specimen, I have kept to my rule of not printing in Roman type, unless the name is written in full by Linné.

The numbers following the genera refer to the running numbers of the Catalogue of the Herbarium, as printed in Proc. Linn. Soc. 1906-7, pp. 96-112.

The numbers (1, 2, or 3) following the species refer to the enumeration in which they first occur, thus:—

In 1753	by the figure	1.
„ 1755	„	2.
„ 1767	„	3.

These lists are fully explained on p. 10. Where no figure follows, the specimen was obtained after 1767, or was by some accident not recorded by Linné.

The same specimen was frequently shifted by Linné, as his views of affinity changed. I have tried to point out where a specimen may be found, by adding the later name, as under *ACHYRANTHES repens* = *Illecebrum Achyrantha*, which means that the specimen is now in *ILLECEBRUM*. MS. names are shown by that abbreviation; when they were published in the 'Supplementum' which bears the name of the younger Linné as author, the abbreviation of "Suppl." has been affixed; this has the further interest of pointing out which species in that work are really due to the father and not to the son.

The types of the younger Linné in the herbarium are not as a rule indicated; they have been left for another opportunity. The zoological lists which were brought to light during the preparation of this Index have been printed in 1913.

The numbers following the generic name in Clarendon type, refer to the Catalogue drawn up by David Don and Richard Kippist, when the Linnean Collections were acquired in 1830, after the death of Sir James Edward Smith; they are still used when consulting the Herbarium.

(Some modifications have been made in the MS. Catalogue, which are explained in the Foreword.)

HISTORY OF THE NAME *LINNEA*.

Examples of the use of the generic name *Linnaea* by Linnæus himself several years before it was published in his 'Genera.'

- I. 'Spolia botanica,' a MS. written in 1729; on the first page "Linnaea" has been written, but partially erased, and his patron's name, "Rudbeckia," substituted.  
Originally published by Dr. E. Ährling, but independently discovered again some years afterwards.
  - II. MS. 'Iter lapponicum'; record of 29th May, 1732, o. s. [=9th June, n. s., when specimens were gathered at Tugganforsen]. Published by Sir J. E. Smith (1811), Dr. Ährling (1889), and Prof. T. M. Fries (1913).
  - III. 'Genera plantarum'; p. 188 (1737) nominally by J. F. Gronovius, but drawn up in Linnæus's style, and not that of Gronovius.
  - IV. Block from a photograph of the actual specimen given by Linnæus to Gronovius, to justify the publication; from Prof. T. M. Fries; the original specimen is in the Botanical Department of the British Museum (Natural History).
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# ADDITIONS AND CORRECTIONS

TO THE

## “INDEX”

ISSUED AS A SUPPLEMENT

in 1912

TO THE ‘PROCEEDINGS’ OF THAT DATE.

Page 8, line 4 from bottom, the last word should read actual.

11, after line 33, insert COMMERSON, PHILIBERT (1722-1773),  
dried plants received in 1754.

14, line 40. read GERHARD.

15, ,, 13, for p. 17 read p. 18.

18, after line 6, insert WEIGEL, CHRISTIAN EHRENFRIED (1748-  
1831), plants from Griefswald.

18, line 33, for autumn read spring.

23, ,, 5 from bottom, for On read Om.

26, line 3, read D. Solander.

27, col. 1. ACER *orientale* = *creticum*.

2. ACHILLEA *inodora* = *Athanasia annua*.

28 2. ACROSTICHUM *ferrugineum* = *ferruginosum*.  
*nodosum* cf. *Asplenium nodosum*.

29 1. ADIANTUM *pygmaeum*, lapsu, vide *Asplenium pygmaeum*.

30 2. AIZOON *lanceolatum* cf. *paniculatum*.

32 1. ALOPECURUS *grossarius* cf. *Panicum grossarium*.  
ALYSSUM *Alyssoides* = *calycinum*.

34 1. ANDROPOGON *quadrivalve* = *nutans* (err. typ.).  
ANEMONE *canadensis* cf. *pennsylvanica*.

- Page 34, col. 2. philadelphia MS. lapsu = *penusylvanica*.  
 ANONA discreta = Unona discreta.
- 35 1. ANTHEMIS *cretica* = *moutana*.  
*fruticosa* = Osmites Bellidiastrum.  
 ANTHERICUM *hispidum* cf. *Asphodelus capensis*.
- 36 1. ANTIRRHINUM hastatum, MS. = *cirrhosum*.
- 37 2. ARENARIA *mucronata* = *Alsine mucronata*.
- 38 1. AREFIA *Vitaliana* = *Primula Vitaliana*.  
 2. ARTEMISIA *ambigua* cf. *Seriphium ambiguum*.
- 40 1. ASPARAGUS *terminalis* = *Dracaena terminalis*.  
 2. ASPHODELUS *capensis* = *Anthericum hispidum*.  
 ASPLENIUM *radicans* = rhizophorum.  
 rhizophyllum. 2. = rhizophorum.
- 41 1. ASTER *oppositifolius* = *Cineraria Amelloides*.  
*polifolius*. 3. = *Inula caerulea*.  
 2. ASTRAGALUS *tenuifolius*. 3. = *A. Onobrychis*.  
*tragoides* = *tragacanthoides*.
- 42 1. ATRACTYLIS *fruticosa* = *Gorteria fruticosa*.
- 43 1. AZALEA *pontica* = *Rhododendron* [flavum, G. Don, non  
*ponticum*, L.].
- 44 2. BETONICA *hirta* = *Stachys recta*.  
*BIDENS fruticosa* = *Verbesina fruticosa*.
- 45 2. BORASSUS *flabelliformis* MS. = *flabelifer*.
- 47 1. BRYUM *capillare* = *Mnium capillare*.  
 2. *rubrum* = *simplex*.  
 BULBOCODIUM *serotinum* = *Anthericum serotinum*.
- 48 1. BUPLEURUM *villosum* = *Hermas depauperata*.
- 51 1. CAPRARIA *gratioloides* = *Lindernia Pyxidaria*.  
 CARDAMINE *Lunaria* = *Ricotia aegyptiaca*.
- 52 2. CARTHAMUS *corymbosus* = *Echinops corymbosus*.  
 CASSIA *galegifolia* = *biflora*.
- 54 1. CENTAUREA *fruticosa* = *Staehelina fruticosa*.  
 2. *sessiliflora* = *nigra*.
- 55 2. CHENOPODIUM *altissimum* = *Salsola altissima*.
- 56 1. *fruticosum* = *Salsola fruticosa*.  
*hirsutum* = *Salsola hirsuta*.  
*salsum* = *Salsola salsa*.  
*virginicum*. 1. = *aristatum*.  
 CHIRONIA *dodecandra* = *Chlora dodecandra*.  
 CHLORA *dodecandra* ut supra.  
*perfoliata*. 3. cf. *Gentiana perfoliata*.
- 57 2. CINERARIA *sonchifolia* cf. *Othonna sonchifolia*.
- 59 1. CLERODENDRUM *scandens* MS. cf. *Knoxia scandens*.  
 CLITORIA *brasiliiana* = *Glycine Galactia*.  
*Galactia* = *Glycine Galactia*.



- Page 59, col. 2. CLUTIA [postea CLUYTIA].  
 CLYPEOLA *Alyssoides* = *Alyssum calycinum*.  
*line 6, read Alaternoides.*  
 „ 18, *read calycinum.*
- 60 1. COMETES *surattensis* = *alterniflora*.  
 2. COMMELINA *axillaris* = *Tradescantia axillaris*.  
*cristata* = *Tradescantia cristata*.
- 61 1. CONVULVULUS *aculeatus* = *Ipomoea Bona-nox*.  
*aegyptius* = *pentaphyllus*.  
*alsinoides* = *Evolvulus alsinoides*.  
*gangeticus* cf. *Evolvulus gangeticus*.  
*linifolius* = *Evolvulus linifolius*.  
 2. *nummularius* = *Evolvulus nummularius*.  
*tridentatus* = *Evolvulus tridentatus*.
- 62 1. CORDIA *Bourreria* = *Ehretia Bourreria*.  
*glabra*. 1. cf. *C. Callococca*.  
 2. COREOPSIS *angustifolia* = *Rudbeckia angustifolia*.
- 63 1. COTULA *capensis* cf. *Matricaria capensis*.
- 64 1. CRASSULA *ramosa* MS. [post ‘*punctata*’ ponendum].  
 2. *line 12, read Rhagadioloides.*  
 CROTALARIA *alba* = *Sophora alba*.
- 65 1. *villosa* = *Sophora biflora*.  
 CROTON *ricinocarpus* cf. *Mercurialis procumbens*.
- 66 1. CYNANCHUM *aphyllum* cf. *Euphorbia viminalis*.
- 67 1. CYTISUS *aethiopicus* = *Ononis cernua* [ $\beta$ ].  
 2. *monspeulanus* = *Genista candicans*.
- 68 2. DIANTHUS *saxifragus* = *Gypsophila saxifraga*.  
 DIAPENSIA *helvetica* = *Aretia helvetica*.
- 69 2. DOLICHOS *pubescens*. 3. cf. *Glycine tomentosa*.
- 70 1. DRACOCEPHALUM *sibiricum*. 3. cf. *Nepeta sibirica*.  
 2. DRUPINA *cristata* [= *Besleria bivalvis*, Linn. f.].  
 ECHINOPS *corymbosus* cf. *Carthamus corymbosus*.
- 71 1. ELLISIA *acuta* = *Duranta Ellisia*.
- 72 2. ERICA *pallide-purpurea* = *purpurascens*.
- 73 2. ERYTHRINA *Piscipula* cf. *Piscidia Erythrina*.
- 74 1. *line 19, read Colpoon* = *Cassine capensis*?
- 75 1. EUPHORBIA *viminalis* cf. *Cynanchum aphyllum*.  
*Evolvulus gangeticus* cf. *Convolvulus gangeticus*.
- 76 1. FEVILLEA *trilobata* . . . 1179] cf. *Trichosanthes punctata* (pl.).
- 77 1. FUCUS *excisus* = *canaliculatus*.  
*muscoides* = *aculeatus*.  
 2. FUMARIA *cucullata* [ante “*Cucullariam*” ponenda].
- 79 1. GENTIANA *perfoliata*. 1. cf. *Chlora perfoliata*.  
*quadrifolia* = *Chlora quadrifolia*.

- Page 79, col. 2. GERANIUM rapacem cf. prolificum.
- 80 1. GERARDIA nigrida [transponenda ab Gesneria].  
GESNERIA [nigrida, lapsu, vide supra].  
GINKGO [sphalm. GINGKO].
- 81 1. GLYCINE tomentosa. 1. cf. Dolichos pubescens.  
GNAPHALUM decurrens = Conyza decurrens.  
2. *nireum* = Stoebe gnaphaloides.
- 82 1. *virgatum* = Conyza virgata.
- 84 1. HEDYSARUM Ecastophyllum. 3. cf. Pterocarpus Ecastophyllum.  
*prostratum* = Indigofera emeaphylla.
85. 2. HESPERIS *provincialis* = Chieranthus tristis.  
HIBISCUS *cancellatus* Suppl. (" Cf. " deletur).
- 86 2. HIPPOMANE *glandulosa* = *biglandulosa*.
- 87 2. HYDRASTIS canadensis. 3. cf. Hydrophyllum canadense.  
HYDROPHYLLUM canadense. 3. cf. Hydrastis (ut praec.).
- 88 1. HYOSCYAMUS *atropoides* = II. Belladonna (ponitur post  
" album ") (non Belladonnae).  
HYPERICUM *chinense* = monogynum.
- 89 1. HYPOCHAERIS *urens* cf. Seriola *urens*.  
HYPOXIS ovata Linn. f. [post " minuta " ponenda].
- 90 2. INULA *Trivis* = Perdicium radiata.  
IPOMOEA *alba* = I. Bona-nox.  
*rubra* cf. Polemonium *rubrum*.  
*verticillata* = Convolvulus verticillatus.
- 93 1. KNOXIA *scandens* = Clerodendrum scandens MS.  
2. LAETIA *americana* = *apetala*.  
*Thamnia* = *apetala*.
- 94 1. LAPSANA *capillaris* = Crepis virens.  
*chondrilloides* = Crepis pulchra.
- 95 1. LEONTODON *Dandelion* = Tragopogon Dandelion.  
*lanatum* = Tragopogon lanatum.  
LEONURUS indicus cf. Phlomis zeylanica.
2. LEUCADENDRON *acaulon* [= Protea acaule, Thunb.].  
*cancellatum* = Protea pinifolia ♀.  
*Conocarpodendron* [= Lencospermum conocarpum,  
R. Br.].  
*Scolymocephalum* [= Protea Scolymus, Thunb.].
- 98 2. LOBELIA *hirta* = zeylanica.  
prona MS. [pone post " Plumieri "].  
volubilis [Burm. f.] [post " urens " ponenda].
- 99 1. LONICERA *parasitica* cf. Loranthus *lonicerioides*.  
LORANTHUS *lonicerioides* [ut praec.].  
LOTUS mauritanicus. 3. cf. Ononis mauritanicus.  
prostratus. 3. cf. Ononis prostrata.

- Page 102, col. 1. MATRICARIA capensis. 3. cf. *Cotula capensis*.  
*inodora* = *Chrysanthemum inodorum*.  
*recutita* = *suaveolens*.
2. MELALEUCA *Leucadendron* (pl.) cf. *Myrtus Leucadendron*.  
MELAMPODIUM australe (m. l. f.) cf. *Uxixia camphorata*.
- 103 2. MERCURIALIS *procumbens* cf. *Croton ricinocarpus*.
- 105 1. MIMOSA *cinerea* cf. *M. Cineraria*.
- 106 2. MUCOR *unctuosus* = *septicus*.
- 107 2. MYRTUS *Leucadendron* = *Melaleuca Leucadendron*.  
NAPAEA *larvis* = *hermaphrodita*.  
*seabra* = *dioica*.  
NARDUS *articulata* = *Aegilops incurvata*.
- 108 1. NEPETA *latifolia* MS. [pone post '*italicam*'].  
*sibirica*. 1. cf. *Dracocephalum sibiricum*.  
2. OCHXA *Jabotapita* = *squarrosa*.
- 109 1. OENOTHERA *parennis* = *pumila*.  
OLDENLANDIA *capensis* (non *capense*).  
2. OSONIS *cernua* cf. *Cytisus aethiopicus*.
- 110 1. OPHRYS *latifolia* = *lilifolia*.  
2. ORECHIS *satyroides* cf. *lyflora*.
- 111 1. *line 34, read* *Scorpioides*.
- 112 1. OTHONNA *geifolia* = *Cineraria geifolia*.  
*parvifolia* cf. *Senecio rigens*.  
*sonchifolia* cf. *Cineraria sonchifolia*.
- 113 1. PANICUM *repens* [non '*repens*'].  
2. PARIETARIA *zeylanica* = *Urtica alienata*.  
PASSERINA *dodecandra* = *Struthiola erecta*.
- 115 2. PHACA *sulcata* = *Astragalus sulcatus*.
- 116 2. PHLOMIS *zeylanica* cf. *Leonurus indieus*.
- 117 2. PISCIDIA *Erythrina* cf. *Erythrina Piscipula*.
- 118 2. PLINIA *pinnata* = *crocea*.
- 119 1. POLEMONIUM *rubrum* cf. *Ipomoea rubra*.
- 121 2. PORTULACA *Potulacastrum* = *Sesuvium Portulacastrum*.  
*triangularis* cf. *racemosa*.
- 122 1. PROTEA *fusca* = *P. Levisanus*.
- 123 1. PSORALEA *pinnata*. 1. cf. *Indigofera enneaphylla*.  
2. PTERIS *dichotoma* = *Aerostichum furcatum*.  
*rufa* = *Aerostichum rufum* [Am. Acad. ed. Schreb  
i. 276].  
PTEROCARPUS *Ecastaphyllum* cf. *Hedysarum ecastaphyllum*.
- 124 1. QUERIA *canadensis* ["*canadensi*" err. typ.].  
2. RANUNCULUS [*flagelliformis*, Sm.] "*Mutis*" m. *Lim*  
*apud herb. Sm.*

- Page 125, col. 1. RAUVOLEA *tetraphylla* = nitida + canescens.  
 RESEDA *suffruticulosa* = fruticulosa.
2. RHAMNUS *siculus* = pentaphyllus.
- 126 2. ROBINIA *Acacia* = R. Pseud-acacia.
- 129 1. SALIX *depressa* = lanata.
- 131 1. SATUREJA *virginiana* = Thymus virginicus.
- 132 1. SCHOENUS *denustus* MS. [cf. seq.].  
*ustulatus* = denustus.
- 135 2. SERIOLA *urens* cf. Hypochaeris *urens*.  
 SERIPHUM *ambiguum* cf. Artemisia *ambigua*.  
 SERRATULA *Chamaepeuce* cf. Staehelina *Chamaepeuce*.
- 136 1. SESILI *Carvifolia* = Selinum *Carvifolia*.  
 SINTHORPIA *africana* = peregrina q. v.  
*peregrina* = Disandra prostrata.  
 SICYOS *trifoliata* = Cissus *acida*.
- 137 1. SILPHIUM *helianthoides* = solidaginoides.
- 138 1. *line 12, for "groecum" read "gracum."*
- 139 1. SOLIDAGO *Doronicum* = Senecio *Doronicum*.
- 140 2. SPINIFEX *squarrosus* [non 'suarrosus'].  
 SPONDIAS *lutea* [non 'lutea'].
- 141 1. STACHYS *recta*. 3. cf. *Betonica hirta*.  
 STAHELINA *Chamaepeuce* cf. *Serratula Chamaepeuce*.
- 143 2. THESIUM *Frisea* [non 'Frisea'].
- 144 1. THYMUS *virginicus* cf. *Satureja virginiana*.  
 2. TOURNEFORTIA *cymosa*. 3. cf. *glabra*.
- 145 2. TRICHOSANTHES *punctata* (pl.) cf. *Fevillea trilobata*.
- 146 1. TRIFOLIUM *fruticans* = Psoralea *bracteata*.  
*Melilotus* var. *corniculata* = *Trigonella corniculata*.  
 2. TRIGONELLA *corniculata* [cf. *praec.*].
- 147 1. TRITICUM *hybernum* [non *hybernum*].
- 148 1. UNONA *discreta* (pl.) cf. *Annona discreta*.  
 UNXIA *camphorata*. *Suppl.*, cf. *Melampodium australe*.  
 URTICA *africana* MS. = *capensis*, *Linn. f.*
- 149 2. VERBESINA *fruticosa* (m. l. f.) cf. *Bidens fruticosa*.
- 150 2. VIOLA *arborea* cf. *V. Hybanthus*.
- 151 2. XERANTHEMUM *ciliatum* = *Gorteria squarrosa*.  
*crucifolium* = *Centaurea radiata*.
- 152 2. ZINNIA *peruviana* = *pauciflora*.

PROCEEDINGS  
OF THE  
LINNEAN SOCIETY OF LONDON.



135TH SESSION.

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FROM NOVEMBER 1922 TO JUNE 1923.

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## PUBLICATIONS: SESSION JULY 1922-JUNE 1923.

## Journal, Botany.

Vol. XLVI.	No. 306.	10/-
	„ 307.	18 -
	„ 308.	12 -

## Journal, Zoology.

Vol. XXXV.	No. 232.	10/-
	„ 233.	10/-
	„ 234.	10/-
	„ 235.	12/-

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Proceedings, 134th Session, November 1922. 6/-

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List of [Fellows, Associates, and Foreign Members], Nov. 1922.



# PROCEEDINGS

OF THE

## LINNEAN SOCIETY OF LONDON.

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(ONE HUNDRED AND THIRTY-FIFTH SESSION,  
1922-1923.)

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November 2nd, 1922.

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 15th June, 1922, were read and confirmed.

A special vote of thanks was passed by acclamation to Dr. W. RUSHTON PARKER for his gifts of the last edition (11th) of 'The Encyclopædia Britannica,' 32 quarto vols. on thin paper, and case; the 'New Oxford Dictionary,' complete to date, with shelves to accommodate the set; Sommi's edition of Buffon's 'Histoire Naturelle,' 127 vols., with six vols. of 'Suites à Buffon'; and 106 additional portraits of naturalists and patrons of botany.

Mr. Reginald Cory, Mr. Harry Bertram Harding, and Mr. Hugh Vandevaes Lely were admitted Fellows.

The certificate in favour of Mr. William Henry Wilkins was read for the second time.

The following were proposed as Fellows:—

Miss Annie Dixon, F.R.M.S.; Joseph Bunny; Zenon Ioannon Solomides; Miss Elizabeth Marianne Blackwell; Miss Helena Bandulska, M.Sc.; Robert Edward Chapman; and George Allan Frost.

The President gave notice that a Ballot for Fellows would take place on the 14th December next; he also announced that two vacancies now exist for Associates, due to the deaths of Robert Allen Rolfe and William Cole.

The President read the following proposed alterations in the Bye-Laws:—

Chap. VIII. Sect. 1 (p. 21). To omit the following: "and each Anniversary Meeting shall also be advertised in Two or more of the Public Newspapers, at least one week before the same takes place."

(Now needless, as every Fellow has notice.)

Chap. VIII. Sect. 4 (p. 22). For "Three o'clock" substitute "Five o'clock"; for "Half-past Three o'clock" substitute "Half-past Five o'clock"; and for "Four o'clock" substitute "Six o'clock."

(Thus altering the hour of meeting from 3 to 5 P.M.)

Chap. X. Sect. 8 (p. 24). After "Iron Chest," insert "or with the Society's Bankers, and the Iron Chest shall".

(Giving power to lodge securities at the Bank.)

The first communication was by Dr. A. B. RENDLE, F.R.S., Sec.L.S., on "Early specimens of *Dahlia* and *Chrysanthemum* from the Banksian Herbarium," illustrated by lantern-slides.

Mr. J. BRITEN contributed a few additional remarks.

Dr. RENDLE also showed on behalf of Mr. ALFRED O. WALKER, F.L.S., a vine-tendril bearing a ripe grape, and explained the relation of tendrils to inflorescence in the vine.

The meeting sent its best wishes to our veteran Fellow, now entering his 91st year.

Mr. JULIAN S. HUXLEY then gave his paper on "The Courtship of Birds," with slides from his own drawings and other sources in illustration; it was communicated by Prof. E. S. Goodrich, F.R.S., Sec.L.S.

A discussion followed, in which the President, Mr. W. P. Pycraft, A.L.S., and Lt.-Col. J. H. Tull Walsh engaged, the author replying.

Dr. B. DAYDON JACKSON, Gen.Sec.L.S., then made a short statement concerning the use of the name *Forstera* or *Forsteria*, both used by Linné in his herbarium with his note *Forstera vaginalis*, on a sheet which formerly had a grass-like plant glued upon it, and therefore was widely separated from the Styliidiaceous genus which at the present day bears the name *Forstera*. Further doubts as to the respective shares of SPARRMAN, G. FORSTER, and LINN. f. were raised by statements published by Linn. f. and the Forsters.

November 16th, 1922.

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 2nd November, 1922, were read and confirmed.

Mr. Robert Gurney, M.A., F.Z.S., M.B.O.U., was admitted a Fellow.

The Certificates in favour of the following were read for the second time:—

Miss Annie Dixon, F.R.M.S.; Joseph Bunny; Zenon Ioannon Solomides; Miss Elizabeth Marianne Blackwell, M.Sc. (Liverpool); Miss Helena Bandulska, M.Sc.; Robert Edward Chapman, M.Sc. (Leeds); and George Allan Frost, F.G.S.

The following were proposed as Fellows:—

Frederick Tom Brooks, M.A. (Cantab.); Robert McGillivray; George Norman Bunyard; and Montagu Charles Allwood, F.R.H.S.

The President read the proposed alterations in the Bye-Laws, as announced on the 2nd November, for the second time.

The President also read a letter from Mr. A. O. WALKER, expressing his appreciation of the message sent to him from the last Meeting.

The first communication was by Mr. A. J. WILMOTT, B.A., F.L.S., entitled "*Orchis latifolia*, Linn. (Marsh Orchis) from the Island of Öland, Sweden obtained from the station in which it was found by Linnæus in 1741." The author, in the following abstract supplied by him, stated:—

It was pointed out that *O. latifolia*, L., 1753, was a general name for Marsh Orchids, but in 1755 this name was limited without varieties, and separated from *O. incarnata* and *O. sambucina*. The diagnosis is general, and comes from Linnæus's article in Act. Upsal. 1740, where it applies mainly to unspotted-leaved plants. The plant referred to as "it. oel. 48" was *O. sambucina*, but the "*O. palmata palustris non maculata*" of "it. oel. 48" was *pratensis*. This is referred by Linnæus in MS. notes to Fl. Suec. (ed. 1) no. 728 var. (728 being referred to under *O. latifolia*), and is what remains when *O. sambucina* has been separated. The herbarium specimen is also *O. pratensis*, matching one brought back by Mr. Edwards from the identical spot in Öland. The plant of the 'Hortus Cliffortianus' which

grew around Haarlem might possibly be *O. protermissa*, but Linnæus said "Variat foliis maculatis & immaculatis," which indicates that hybrids with *O. maculata*, or perhaps *O. majalis*, were included. This was, however, his earliest work on the subject, being published in 1737 before he saw Vaillant's orchids or travelled in Öland. The Vaillant plant referred to, seen *in situ* by Linnæus in 1738, was the most common one round Paris with unspotted leaves: also probably *O. protermissa*. Of the Bauhin plants, the "type" of 1753 and the var.  $\beta$ , which are respectively the var. *a* and "type" of his 1740 paper in Act. Upsal., are both unspotted-leaved plants, the "non maculata" and "latifolia" of the pre-Linnean authors; most likely both were forms of *O. protermissa*. The var.  $\epsilon$  of the 'Species Plantarum' was probably *O. majalis*, for the figure in Rudb. Elys. is good *majalis*. All of this indicates that by *O. latifolia* Linnæus had primarily in mind *O. protermissa*. But Linnæus, in his description of 1755, says that the leaves are slightly spotted. This may refer to the decay spots on the plant in his herbarium, for this note was made when he described *O. incarnata* in the MS. notes in his copy of the 'Flora Suecica,' ed. 1, or it may refer to the hybrid forms with spotted leaves which occur where *O. protermissa* and *O. maculata* occur together. The description of *O. incarnata* refers to the form so named by British botanists to-day. Linnæus knew *O. protermissa*, and included it under n. 728 of Fl. Suec. ed. 1, which became *O. latifolia*. It seems fairly clear that by *O. latifolia* Linnæus in 1755 understood *O. protermissa*, perhaps including the hybrid with *maculata*. Certainly he did not intend *O. majalis*, Reichb.

A discussion followed in which Mr. W. N. Edwards (visitor), Mr. C. C. Lacaita, Mr. T. A. Dymes, Mr. H. W. Pugsley, and Lord Rothschild engaged, the author replying.

Mr. T. A. SPRAGUE then gave a description, with a large number of specimens, of Twin-leaves and other abnormalities in the Common Ash, *Fraxinus excelsior*.

Specimens were shown of the following abnormalities:—

1. Fasciated stems, with dichotomous branching.
2. Bud-variation, with narrow caudate-acuminate leaflets.
3. Accessory leaflets; one or both leaflets of a pair replaced by sessile or stalked bifoliolate pinnæ.
4. False accessory leaflets, by suppression of the internode above the lower pair of leaflets.
5. Confluent leaflets.
6. Twin-leaves and Triplets: occurring in various forms—Nature of leaf-twinning—Cause of this abnormality, probably hypertrophy—Significance of accessory and twin-leaves.
7. Anisophylly, the foliage leaf having a bud-scale as its nodal companion.
8. Suppression of a leaf: examples shown of complete or partial suppression of one leaf of a pair without disturbance of the opposite-decussate phyllotaxy, which continues as though the missing leaf were present.

Lt.-Col. J. H. Tull Walsh, Mr. J. W. Bodger, Dr. E. J. Salisbury, and Lord Rothschild discussed the paper, the last-named commenting on similar manifestations in *Pistacia Lentiscus*, the Terebinth, in certain parts of Algeria.

The last paper, by Dr. R. J. TILLYARD, on the wing-venation of the Order Plectoptera or May-flies, was postponed.

November 30th, 1922.

DR. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 16th November, 1922, were read and confirmed.

Certificates in favour of the following were read for the second time :--

Frederick Tom Brooks, M.A. (Cantab.); Robert McGillivray; George Norman Bunyard; and Montagu Charles Allwood, F.R.H.S.

Charles Chubb, M.B.O.U., was proposed as an Associate.

The alterations in the Bye-laws, read from the Chair on the 2nd and 16th November, were balloted for and accepted.

Dr. A. B. RENDLE, F.R.S., Sec.L.S., exhibited a visitors' book, in use from 1778 to 1811, by Sir Joseph Banks, Bt., P.R.S., the weight of the visitors being noted. The book contains the names of many well-known botanists of the period and of other visitors to Banks's herbarium and library. Some of the entries are in Banks's hand, others are autograph; many are by Jonas Dryander, who was librarian to Banks from 1782 till his death in 1810. In several cases the same person is recorded at different dates, and the variation in weight is curious and interesting. Banks was weighed 13 times, his weight increasing from 13st. 10 lbs. to 16 st. on 14th April, 1811.

The General Secretary commented on two names mentioned by Dr. Rendle as occurring in the volume: (1) Sir Charles Blagden, a noted physician and close friend of Banks, appreciated also by Dr. Samuel Johnson, whose "Blagden, sir, is a delightful fellow" occurs in Boswell's 'Life of Johnson'; and (2) Prof. von Linné, who was Banks's guest in 1782, and was present when Solander was struck down by apoplexy in that year; the professor's weight was 12 st. 3 lbs., which shows that he was a bigger man than his father, the famous naturalist.

A paper by Dr. R. J. TILLYARD on "The Wing-venation of the Order Plectoptera or May-flies" was read in title by Prof. E. S. Goodrich, F.R.S., Sec.L.S.

The next paper, "The Structure of certain Palaeozoic Dipnoi [Fishes]," by Prof. D. S. M. WATSON and Mr. E. L. GILL, communicated by Prof. E. S. Goodrich, F.R.S., Sec.L.S., was explained by Prof. WATSON, with the help of a series of lantern-slides.

The President, in commenting upon the value and interest of the paper, alluded to the Northumbrian coal-miner, Thomas Atthey, to whose care and assiduity the splendid collections at Newcastle-on-Tyne are so greatly indebted. Other speakers were Prof. Goodrich and Mr. J. R. Norman (visitor), to whom Prof. Watson replied.

The General Secretary exhibited a copy of a volume entitled 'The Giant Trees of Victoria,' by Mr. J. DUNCAN PEIRCE, C.E., an expert photographer, of which only 25 copies were printed; there are 8 plates, averaging 16 in.  $\times$  12 in. Mr. Peirce stated that the tallest trees grew in gullies between ridges, the greater moisture and abundance of leaf-mould conducing to their height, but the highest tree measured proved to be only 326 feet 1 inch.

Mr. G. W. E. LODER remarked that the height of the Australian *Eucalyptus* had probably been exaggerated and did not equal that of the American Big-trees, and Dr. RENDLE added further comments.

December 14th, 1922.

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 30th November, 1922, were read and confirmed.

Mr. Willis Openshaw Howarth, M.Sc., was admitted a Fellow.

John Roxbrough Norman and Major Robert Beresford Seymour Sewell, I.M.S., were proposed as Fellows.

Major Charles Hunter, M.Sc.(Durh.); William Nowell, D.L.C.; William Frederick Neville Greenwood; William Henry Wilkins; Miss Annie Dixon, M.Sc. (Manch.); Joseph Bunny; Prof. Zenon Ioannou Solomides; Miss Elizabeth Marianne Blackwell, M.Sc. (Liverp.); Miss Helena Bandulska, M.Sc.; Robert Edward Chapman, M.Sc. (Leeds); George Allan Frost, F.G.S.; Frederick Tom Brooks, M.A. (Cantab.); Robert McGillivray; George Norman Bunyard; and Montagu Charles Allwood, were elected Fellows.

Prof. POULTON, F.R.S., introduced an exhibition of coloured lantern-slides, showing a new discovery in Mimicry of South American Butterflies.

Mr. W. J. KAYE (visitor), Sir Sidney F. Harmer, and Lt.-Col. J. H. Tull Walsh took part in the discussion which followed.

Mr. W. O. HOWARTH then gave his paper "On the occurrence of *Festuca rubra* in Britain," illustrating it with dried specimens.

Mr. H. W. PUGSLEY exhibited a series of specimens of British species of *Calamintha*, including a species new to this country.

The involved nomenclature of the true *Calaminthas*, which were placed in the genus *Melissa* by Linnaeus, was first alluded to, and reasons given for treating the three recognised British species as *Calamintha ascendens*, Jord., *C. Nepeta*, Savi, and *C. sylvatica*, Bromfield. The new form, first found near Swanage, in Dorset, in 1900, and again in 1912, was identified with *C. batica*, Boiss. & Reut., although showing differences in minor features, which were attributed to climatic influence. The salient characters of *C. batica* were pointed out, and contrasted with those of the other British species, and the geographical distribution of the new plant indicated, with special reference to its interest as an additional unit in the Lusitanian element in the British Flora.

In the discussion which ensued, Mr. H. S. Thompson, Mr. T. A. Dymes, Mr. E. G. Baker, Mr. A. H. Maude, Mr. C. E. Salmon, and Mr. F. N. Williams engaged, and Mr. Pugsley replied.

Dr. LILY BATTEN then gave a condensed account of her paper:— "The Genus *Polysiphonia*; a critical revision of the British species, based upon anatomy." (Communicated by Prof. Dame Helen Gwynne-Vaughan, D.B.E., D.Sc., F.L.S.)

Dr. Marion Delf and Prof. Neilson Jones contributed additional remarks, and the author replied.

January 18th, 1923.

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 14th December, 1922, were read and confirmed.

Frederick Tom Brooks, M.A. (Cantab.); George Norman Bunyard; Miss Helena Bandulska, M.Sc.; Frederick Berry-Lewis Butler; George Allan Frost; and Joseph Bunny, were admitted Fellows.

Certificates in favour of John Roxbrough Norman and Major Robert Beresford Seymour Sewell were read for the second time.

Edward Arthur Wilson was proposed as a Fellow.

Charles Chubb was elected an Associate.

The President announced the death of Prof. GASTON EUGÈNE MARIE BONNIER, a Foreign Member; also that Ballots for Fellows will be taken on the 1st March and 3rd May.

Capt. G. H. WILKINS, introduced by Dr. A. B. RENDLE, F.R.S., Sec.L.S., exhibited a dried vegetable mass made from a variety of wild plants, *Chenopodium* and others, which are now an important element in the food-supply of the Russian peasantry; the plants are dried, pounded to a fine flour, and mixed with rye to make coarse cakes.

He then gave an account of the Shackleton-Rowett Expedition in the 'Quest' to the Antarctic Regions. On St. Paul's Rocks no plants save a few Algae were found, but at South Georgia, an island about 100 miles long and 20 miles broad, a considerable collection was made, though the flora is fairly well known, and reindeer thrive. Lichens and mosses only were observed on Elephant Island; Tristan da Cunha was visited and 16 species gathered. Gough Island is known from the 'Scotia' reports; the most conspicuous member of the flora is *Phyllica arborea*, growing to 20 feet; a variety of *Sophora tetraptera* is now described. Tussock-grass, ferns and *Empetrum* grow luxuriantly, and an *Apium*, hitherto confused with congeners, is now described. The specimens have been presented to the British Museum by Mr. J. Q. Rowett. The lecture was illustrated by a series of fine lantern-slides.

A discussion followed in which the following engaged:—The President, Mr. H. N. Dixon, Mr. T. A. Dymes, Dr. A. B. Rendle, and Mr. C. C. Lacaïta; Capt. Wilkins replying.

Mr. E. G. BAKER then followed with a resumé of the flora of Gough Island, 20 flowering plants and 10 ferns being now known from it. Amongst these may be named the endemic *Cotula goughensis* Rud. Br., *Hydrocotyle leucocephala* Cham. & Schlecht., *Gnaphalium pyramidale* Thouars, *Rumex frutescens* Thouars, and *Empetrum nigrum* L., var. *rubrum* Hemsl. The only small trees on the island are the *Phyllica* and *Sophora* previously mentioned. There is also a new species of *Apium* allied to *A. australe* Thouars, but having broad cuneiform segments to the leaves. The widely-spread fern *Lomaria Boryana* Willd. reaches a height of from 2 to 3 feet.

Miss HELENA BANDULSKA, M.Sc., read her paper "The Cuticular Structure of certain Dicotyledonous and Coniferous Leaves from the Middle Eocene Flora of Bournemouth," illustrated by lantern-slides.

The President, Dr. Marie Stopes, Mr. W. N. Edwards (visitor), Dr. D. H. Scott, and Mr. H. W. Monckton contributed further observations, and the author replied.



Mr. W. R. SHERRIN showed a small volume containing small specimens of the entire moss-flora of Britain, as a *memoria technica*; also a similar volume, with species and varieties of *Sphagnum*. Dr. A. B. RENDLE and Mr. H. N. DIXON spoke on these exhibits, the latter producing a copy of W. G. MacIvor's 'Hepaticæ Britannicæ; or pocket Herbarium of British Hepaticæ,' New Brentford, 1847, containing 18 folios of specimens. The copy shown was remarkable for an inserted sheet of the alga *Thorea ramosissima* Bory: possibly the only British specimen extant.

February 1st, 1923.

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 18th January, 1923, were read and confirmed.

The certificate in favour of Edward Arthur Wilson was read for the second time.

The following were proposed as Fellows:--

Seevaratnam Arunachalam; Miss Ethel Katherine Pearce, F.E.S.; Edward Wyllie Fenton, M.A., B.Sc.(Aberd.), F.E.S.; and Prof. Robert Scott Troup, C.I.E., M.A.

Dr. A. B. RENDLE, F.R.S., Sec.L.S., exhibited a pocket dissecting microscope, which formerly belonged to Robert Brown, and gave its history. The General Secretary showed the larger instrument which had been presented to the Society twelve months previously: both instruments were provided with single lenses of high power.

Dr. ARTHUR W. HILL, F.R.S., then showed lantern-slides of photographs taken in the Tropical Fern House at Kew, exhibiting the special adaptation of certain species for their lower fronds intercepting débris washed down by rain, which was utilized by the plants.

Sir SIDNEY F. HARMER, K.B.E., F.R.S., F.L.S., then read his paper "On Cellularine and other Polyzoa," illustrated by drawings and lantern-slides. A discussion followed, the participants being the President, Dr. W. D. Lang (visitor), Prof. E. S. Goodrich, Prof. Garstang, and Dr. G. P. Bidder, the author briefly replying.

SIR NICOLAS YERMOLOFF, K.C.B., K.C.V.O., F.L.S., read his "Notes on *Chatoceros* and allied genera, living and fossil," with lantern-slides, of which the following is an abstract:—

The Diatom genus *Chatoceros* shows several peculiar features. It has been highly differentiated for pelagic life. It occurs in the planktons of the colder seas, sometimes, especially in spring, in colossal numbers. Some 100 living species have been described, but only 6 or 7 are common in the planktons.

The parent cells, each consisting of two valves with a hoop between them, form colonies, holding together by means of long setæ. The whole structure of the colony endows it with great floating capacity.

Two features of the genus are especially puzzling: one is that several of the species, though not all, have the capacity to develop inside the mother-cells peculiar internal organs, covered with a thick siliceous wall. These organs, rightly or wrongly, are called *statopores*. No one has ever seen them germinate, and whether they are organs of reproduction, or something like endocysts, or something else, is not known.

The other strange feature of the genus is, that although it is so infinitely numerous in the planktons, nevertheless the mother-cells, or colonies, as such, never appear in any fossil marine deposits. On the other hand, the spores do appear fairly often as fossil remains. Why it is that the vegetative form cannot stand fossilization whilst the spore can do so, is not known.

Although the spores of *Chatoceros* are all built on very similar lines, yet the elder authors, since Ehrenberg, have taken them for separate Diatom genera, and have classified and named them as such. Thus some five new Diatom genera have been created. Of them, three (*Synderium* Ehr., *Dicludia* Ehr., and *Hervothecca* Ehr.) are undoubtedly spores of *Chatoceros*. Two other genera (*Goniothecium* Ehr. and *Xanthiopyxis* Ehr.) may or may not be spores of *Chatoceros*, or of some other form yet unknown.

Fossil spores of *Chatoceros* are to be found frequently enough in Miocene Diatomaceous earths. The most common form is *Synderium* Ehr., which is the spore of *Chatoceros diadema* Gran, very common in the planktons.

Dr. Clarence Tierney (visitor) contributed further remarks, and the author replied.

MR. HUBERT LYMAN CLARK'S paper, "Some Echinoderms from West Australia," communicated by Prof. W. J. Dakin, F.L.S., was, in the absence of the author, read in title.

MISS RATHBONE, F.L.S., brought for exhibition W. Gardiner's 'Musci britannici,' Glasgow, 1836, 8°, with specimens of the mosses; this seems to have been the earliest issue, followed afterwards by the Dundee and London editions.

Mr. CHARLES TURNER, F.L.S., sent a supply of microscope slides of Desmids from Wales, and *Chaetoceros* from Naples plankton, for distribution.

February 15th. 1923.

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 1st February, 1923, were read and confirmed.

Miss Elizabeth Marianne Blackwell, M.Sc. (Liverp.), was admitted a Fellow.

The certificates in favour of Seevaratnam Arunachalam, Miss Ethel Katherine Pearce, F.E.S., Edward Wyllie Fenton, M.A., B.Sc. (Aberd.), F.E.S., and Prof. Robert Scott Troup, C.I.E., M.A., were read for the second time.

Francis Miranda was proposed as a Fellow.

Dr. A. D. IMMS communicated and explained by the help of lantern-slides a paper by Mr. A. M. ALTON, "On the method of oviposition and the egg of the Beetle *Lyctus brunneus*, Steph."

Prof. E. S. Goodrich, Sec.L.S., made a few additional remarks and Dr. Imms replied.

Mr. R. PAULSON exhibited 68 species in 27 genera of Lichens collected by Mr. V. S. Summerhayes, of the Oxford University Expedition to Spitsbergen in 1921. They were derived chiefly from Bear Island, a mass of limestone rock, and Prince Charles Foreland, of siliceous rock. The Gulf Stream influences both islands; most of the Lichens were thoroughly healthy, and had been carefully dried.

Miss A. Lorrain Smith and Dr. Rendle, Sec.L.S., contributed further remarks, and Mr. Paulson replied.

Mr. F. HOWARD LANCOM followed with the following account of curious oviposition by a specimen of the Clouded Yellow Butterfly, *Colias edusa*:—"I do not know that these few notes have any particular scientific value, but I think that the incident which they describe is sufficiently remarkable to be placed on record.

"In early September of last year I had seven captured female specimens of *Colias edusa*, which I kept for the purpose of obtaining ova. Of these, six duly deposited ova in fair numbers.

I had the seventh in confinement for a fortnight without result, the insect steadfastly refusing to lay, although I was convinced that it was fertile. As it also declined to feed, I had recourse to the usual practice in refractory cases of holding the insect by the wings, running out its proboscis on a fine needle, and allowing the end of the organ to rest on a pad of cotton wool which had previously been soaked in sugar water.

"Frequent repetition of this had the effect of rendering the insect quite tame. On the fifteenth day I was demonstrating this fact to a friend by introducing the tip of a finger, to which the insect would immediately cling. After one such occurrence I transferred the insect to a leaf of a potted plant of white clover, when to my surprise it laid an egg. I allowed it to remain for some minutes, and as nothing further happened I decided to repeat the experiment. I transferred the insect to another leaf of the same plant, and it again laid an egg. To cut the story short, I moved it seventeen times and obtained seventeen eggs, after which it refused to lay. So far as I am aware, this butterfly had not previously laid an egg, and never afterwards laid another. It died the following day.

"I can offer no explanation of this butterfly's refusal or inability to lay for the first fortnight. As a reason for its subsequent behaviour, I formed the opinion that, by the end of the fortnight, the insect was in a weak condition and rapidly failing, and having an instinctive knowledge of its approaching end was impelled to deposit its ova while there was yet time; no doubt the bustling it received assisted materially in this direction. I was assisted to this conclusion by the fact that, in one instance, the insect did not wait to be transferred to a leaf but actually attached an egg to my finger. A curious fact was that it would not deposit an egg until it was moved."

The Rev. Canon G. R. BULLOCK-WEBSTER showed a collection of thirty varieties of *Chara hispida*, explaining that in that genus varietal names are discarded, as the variation is so great and so frequent, that confusion would be the result, were it attempted.

The President and Dr. A. B. Rendle spoke on the interest of the exhibition, and Canon Bullock-Webster replied to questions.

The General Secretary exhibited a small volume, for which he had been searching for thirty-eight years, namely C. A. Agardh's 'Aphorismi botanici,' Lundæ, 1817-26, 8<sup>o</sup>, as confirming, in a striking degree, the practice prevalent in Scandinavia down to the middle of the previous century, the Præses being the actual author, and the Respondentes being little better than dummies. In this volume the text runs on, with 16 title-pages, having the names of as many graduates, interposed between each sheet of 16 pages, in no fewer than in twelve instances cutting a word in two and sharing it between two Respondentes.

The work is not in the library of the Linnean Society.

March 1st, 1923.

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 15th February, 1923, were read and confirmed.

Major Charles Hunter was admitted a Fellow.

The certificate in favour of Francis Miranda was read a second time.

The following were proposed as Fellows:—

Clarence Tierney, D.Sc.; The Rev. Francis Rosslyn Courtenay Bruce, D.D.; and Henry Harwood Smith; as Foreign Member, Dr. John Isaac Briquet, of Geneva; and as Associate, William Barclay.

The following were severally balloted for and elected Fellows:—

John Roxbrough Norman; Major Robert Beresford Seymour Sewell, I.M.S., B.A. (Cantab.); Edward Arthur Wilson; Seevaratnam Arunachalam; Miss Ethel Katherine Pearce, F.E.S.; Edward Wyllie Fenton, M.A., B.Sc. (Aberd.), F.E.S.; and Prof. Robert Scott Troup, C.I.E., M.A.

Mr. ASHLEY H. MAUDE gave an exhibition of about 300 specimens gathered from the South Tirol and the Dolomites, explaining those regions by various maps and photographs shown by the lantern.

Mr. J. N. HALBERT, M.R.I.A., contributed a paper, entitled "Notes on the Acari, with descriptions of new species," communicated by Dr. W. T. Calman, F.R.S., F.L.S., which was read in title.

Mr. C. F. M. SWYNNERTON exhibited a series of about sixty lantern-slides, illustrating various aspects of African woodland formations, displaying rain-forest, coppice, and thicket due to grass-fires, the means of prevention from injury by such fires, and the preservation of the forests by careful nurture.

The President stated that the lecture on "Botanic Illustration in Colour" announced for that evening had been postponed by the lecturer, to permit of the display of the series of slides just exhibited, as the author was starting on the 9th instant for East Africa to resume his duties as Game-warden.

March 15th, 1923.

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 1st March, 1923, were read and confirmed.

Mr. Edward Wyllie Fenton, M.A., B.Sc. (Aberd.), Mr. John Roxbrough Norman, Miss Annie Dixon, and Mr. Robert Edward Chapman, M.Sc., were admitted Fellows.

The following certificates were read for the second time: as Fellows, Dr. Clarence Tierney, The Rev. Francis Rosslyn Courtenay Bruce, D.D., and Mr. Henry Harwood Smith; as Associate, William Barclay; and as Foreign Member, Dr. John Isaac Briquet.

The following were proposed as Fellows:—

Mr. Robert Barr, Mr. Henry Charles Abraham, and Mr. William Plane Pycraft.

Mr. G. ALLAN FROST exhibited a large collection of the otoliths of recent fishes. The President remarked upon the extent and interest of the collection.

Mr. JOHN PARKIN brought forward a paper on "The Strobilus Theory of Angiospermous Descent." (See Abstract, p. 51.)

The discussion was carried on by Dr. D. H. Scott, Mr. H. H. Thomas (visitor), Prof. F. W. Oliver, and Dr. A. B. Rendle: reported in the Abstracts.

Mr. PARKIN briefly replied to the observations contributed by the speakers.

Dr. FRANCISCO FERRER (visitor) showed under the microscope slides illustrating the histology of Coelenterates and Sponges, and drew attention to points of special interest.

Professor A. Dendy and Dr. G. P. Bidder contributed further remarks.

Mr. W. E. HOLLOWES sent from Exmouth specimens of *Ranunculus Ficaria* showing unusually bleached flowers.

April 19th, 1923.

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 15th March, 1923, were read and confirmed.

Mr. Robert McGillivray, Mr. Cecil Victor Boley Marquand, M.A. (Cantab.), Mr. Edward Arthur Wilson, Miss Ethel Katherine Pearce, F.E.S., and Mr. Frederick Albert Mitchell-Hedges, F.R.G.S., were admitted Fellows; and Mr. Charles Chubb, an Associate.

Certificates in favour of Robert Barr, Henry Charles Abraham, and William Plane Pycraft as Fellows were read for the second time.

The first communication appointed to be read was by Mr. EDWARD HERON-ALLEN, F.R.S., F.L.S., and Mr. ARTHUR EARLAND, F.R.M.S., on "The Foraminifera of Lord Howe Island, South Pacific," but in the absence of both authors reading was postponed until June 21.

Dr. RENDLE, F.R.S., Sec.L.S., with the aid of a lantern-slide, demonstrated the structure of the fruit of the Mare's-tail (*Hippuris vulgaris* Linn.). The figures and description of the fruit of this well-known British plant in the text-books and floras were unsatisfactory, and overlooked points of detail in structure associated with the germination of the seed. The fruit is a drupe, the upper portion of which around the persistent base of the style, with the seedcoat, is developed in the form of a stopper which is easily withdrawn on soaking the ripe fruit. The embryo ultimately fills the seed, and has the large radicle and hypocotyl so often found in water-plants. The speaker had been unable to get fruits of herbarium specimens several years old to germinate, and suggested that Fellows interested in British botany might look out for seedlings during the next season. The radicle was placed directly beneath the stopper which provided a place of exit on germination.

Dr. RENDLE also showed a three-flowered head of Daffodil, sent by Mr. Ernest Dixon, of Putney. Mr. Dixon mentioned that he was familiar with a double head but had never seen a triplet. Dr. Rendle pointed out that it was an instance of fasciation; the scape showing the characteristic broadened form. The three flowers were of slightly different age, and perfect.

Dr. B. DAYDON JACKSON, Gen. Sec., stated that rather more than three years ago he had given an account before the Society of the History of Botanic Illustration during Four Centuries, but in consequence of the difficulties of illustrating coloured plates by lantern-slides he had expressly excluded that section from his remarks. However, at the close of his lecture, he had been requested by more than one of the audience, to supplement his discourse by such account of colour applied to botanic plates as could be done without lantern-slides, to which he gladly assented, but until now he had been hindered from complying with the request.

Alluding to the methods of producing by printers' ink representations of plants in general, the speaker grouped the main methods into three: (1) where the design was in relief, and received the ink, which by pressure was transferred to paper, as in wood-engraving; (2) where the design was cut or bitten into a plate of metal, as copper-plate engraving, etching, mezzotint, &c.; (3) where the design did not differ much in level from the stone on which it was drawn, but depended upon the antagonism of grease and water, the stone receiving either and then refusing to receive the other. Examples were then shown of early herbals with artless colouring, most of them apparently due to the work of private possessors, but with later years, as in a copy of Fuchs's '*Stirpium historia*,' 1542, printed at Basel, the character of the work pointed to a trained colourist, such as Plantin of Antwerp employed at a later period.

During the prevalence of woodcuts in the early years of printing, copper-plate engraving began to make its way, and was employed in providing outlines for hand-colouring until the last century, when it was ousted by lithography. The method of printing from engraved plates was briefly described, and the application of mezzotint restricted to leaves and stems was pointed out, also Redouté's method of semi-stipple for coloured prints, each colour being separately applied to the plate and cleaned off, before finally heating the plate and pulling the print. A simpler method was also shown, where an ordinary engraving was printed in green ink, and other colours, as red or yellow, applied in water-colour.

After explaining how artistic use of pigments varied, and always must vary from theoretic statements as to primary colours, chromo-lithography was touched upon, and its greater permanence (if lasting colours are employed) to hand-coloured plates, some showing deterioration in less than a century, which was startling.

Next the three-colour process was touched upon, and the preparation of three (or four) half-tone blocks to print its own colour to be combined by the eye into a complete colour scheme. The weakness of the process lay in this, that it almost demanded a paper coated with baryta or china-clay, which could not be guaranteed as permanent: in addition was the temptation to use inks made from aniline dyes, which were fugitive.

Mr. FIXDOR asked if colour printing from wood blocks had been employed; the answer was the display of a Japanese catalogue of *Iris Kämpferi* in which that method was employed.

Mr. L. J. SEDGWICK inquired whether the three-coloured prints in Britton and Rose's "*Cactæ*" were produced by the "wavy line" process. The lecturer thought that the special effect was due to the use of miller's silk as a screen.



Mr. C. E. SALMON referred to Gerard's "Herball," of which certain copies were known to be coloured by hand, and if professional service was employed, the reply being in the negative.

Sir DAVID PRAIN instanced the case of Mr. Pantling in preparing coloured plates for his "Orchids of Sikkim," by training eight native boys to colour his special portion of each plate, the last touches being put in by the last boy, completing the colouring.

Mr. BAKER asked how Curtis's "Flora Londinensis" was coloured, the answer being it was like the 'Botanical Magazine,' done by hand.

Dr. RENDLE inquired whether entire editions, as of "Tragus" (shown), were coloured or only a few copies: the answer was that the larger number of copies known to the lecturer were uncoloured.

Several questions were put during the discourse by Lord Rothschild, Mr. Lester Garland, and Mr. A. W. Sheppard, which were replied to as they arose.

May 3rd, 1923.

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 19th April, 1923, were read and confirmed.

Miss Margery Knight, Miss Joan Beauchamp Procter, F.Z.S., Rev. William Charles Tippet, William Fawcett, B.Sc., Charles Carmichael Arthur Mouro, and Thomas Francis Egan were proposed as Fellows.

The following were elected by ballot: as Fellows: Francis Miranda, Clarence Tierney, D.Sc., The Rev. Francis Rosslyn Courtenay Bruce, D.D., Henry Harwood Smith, Robert Barr, F.R.H.S., Henry Charles Abraham, and William Plane Pycraft: as a Foreign Member, Dr. John Isaac Briquet; as an Associate, William Barclay.

The following were elected by show of hands Auditors for the Society's Accounts for the financial year which ended on April 30:— For the Council: Mr. E. T. Browne and Dr. W. T. Calman; for the Fellows: Mr. S. Edwards and Mr. L. V. Lester-Garland.

The President announced that a Ballot would take place on June 21st next.

Dr. A. B. RENDLE, F.R.S., Sec. L.S., showed a seedling oak, three years old, with a tap-root over thirty inches in length, which he had dug up from his garden on heavy clay. The unusual length was ascribed to the drought of 1921.

After Mr. R. PAULSON had contributed some observations, Dr. C. E. MOSS remarked that at the Cape of Good Hope *Quercus pedunculata* produced roots as short as its congener, *Q. sessiliflora*, in place of the longer root-system noticeable in the former species in Britain.

Professor W. T. GORDON, F.G.S., introduced by Dr. D. H. SCOTT, F.R.S., F.L.S., exhibited an extensive series of lantern-slides illustrating recently obtained specimens of the fossil coniferous genus *Pitys*, obtained from beds of siliceous volcanic ash, at Gullane, 17 miles east of Edinburgh. These comprised a new species, showing cortex and leaves; hitherto nothing was known of the genus, except pith and wood. The most interesting point is the discovery of the leaves.

Dr. D. H. SCOTT pointed out that the leaves showed merely petiolar structure; was there a lamina present? He emphasized the great degree of anatomical development attained by these early plants.

Lieut.-Col. J. H. TULL WALSH said as regards the relation of silica to plants, certain moulds are stated to reduce the silica in laterite. In miners' tuberculosis we know that the presence of colloidal silica encourages the growth of *Bacillus tuberculosis*; and this effect is demonstrated by Prof. Cummins of the Bristol University in the "Tropical Diseases Bulletin" for last March. In the Mogadow creek, N.E. of the Chundion river, tree stumps are found in which silica has displaced the lime of petrification.

Mr. S. L. GHOSE (visitor) also spoke, and Prof. Gordon answered the questions raised.

The next paper, "The Crustacean Plankton of the English Lake District" by Mr. ROBERT GURNEY, F.L.S., was read in title.

Mr. S. L. GHOSE briefly explained the paper he contributed on "A Systematic and Ecological Account of a Collection of Blue-green Algæ from Lahore," pointing out that while much work had been done in India on phanerogamic botany, the lower cryptogams had been almost entirely neglected. The paper was communicated by Prof. F. E. Fritch.

Mr. JAMES GROVES, F.L.S., presented a short paper entitled "Notes on Indian Charophyta."

Mr. J. G. H. FREW demonstrated the chief points of his paper, "On the Morphology of the Head-capsule and Mouth-parts of *Chlorops toniopsis* Meig. (Diptera)" (communicated by Dr. A. D. Imms, F.L.S.); whilst the last paper—also communicated by Dr. Imms—was by Mr. A. M. ALTON, "On the Genital System of the Wood-boring Beetle, *Lyctus brunneus* Steph.," in continuation of a former paper, but now dwelling upon the extraordinary length both of the ovipositor and the rectum.

May 10th, 1923.

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 3rd May, 1923, were read and confirmed.

Mr. William Plane Pycraft was admitted a Fellow.

Certificates in favour of Miss Margery Knight, Miss Joan Beauchamp Procter, F.Z.S., Rev. William Charles Tippet, William Fawcett, B.Sc., Charles Carmichael Arthur Monro, and Thomas Francis Egan were read for the second time.

Prof. Nalini Mohan Mukerjee, M.Sc., Mr. Basant Lal Gupta, M.Sc., and Lilian Alice Mabel, Lady Richmond-Brown were proposed as Fellows.

The President announced that a vacancy in the list of Associates was created by the death of William Henry Pearson.

Letters were read from Dr. JOHN ISAAC BRIQUET and Mr. WILLIAM BARCLAY thanking the Society for their election as Foreign Member and Associate respectively.

Dr. PAUL KAMMERER, of Vienna, delivered a lecture on "Breeding Experiments on the Inheritance of Acquired Characters," of which the following is an abstract; it was illustrated by lantern-slides, specimens, and preparations under the microscope. [Note.—The same lecture was printed *in extenso* in 'Nature,' 12 May, 1923, pp. 637-40.]

In 1909 Dr. Kammerer ascertained that *Salamandra atra* and *S. maculosa* can be bred to interchange their accustomed reproductive characters. If young specimens of *S. maculosa* are kept on a black background they lose much of their yellow markings and appear mainly black; their offspring if similarly treated show a row of small spots in the middle line of the back; if however, these last are reared on a yellow background, these spots fuse to a longitudinal stripe.

The yellow markings of the parent generation reared in yellow surroundings increase at the expense of the black colour; and their descendants, kept in like manner, show yellow in wide bilateral stripes. In the Vienna woods whence he procured his Salamanders, only typically marked specimens occurred, though the striped form (forma *toniata*) is also found in the open. In later experiments

Salamanders from the Hartz Mountains were used, and they showed immediately after metamorphosis, their striped marking; those obtained from Heidelberg were irregularly spotted, but arranged their markings during growth into *terniata*. This development is also reversible; Mr. E. G. Boulenger has confirmed this, and has obtained results far more beautiful and significant than those now under review.

If spotted and naturally striped Salamanders are crossed, Mendelian characters are shown, the spots are dominant, the stripes recessive. If one crosses naturally spotted Salamanders with experimentally striped individuals, the hybrids are intermediate in character.

If ovaries of spotted females are transplanted into naturally striped ones, the appearance of the young is determined by the *true* mother, not the foster-mother, and are irregularly spotted. If on the other hand ovaries of spotted females are transplanted into artificially striped ones, then, if the father is spotted, the young are line-spotted; if the father is striped, the young are wholly striped.

Success has been obtained in developing the rudimentary eye of *Proteus* into a full-sized functioning eye, by means of red light for five years from birth. Exposure to ordinary daylight is not effective, the skin which covers the rudimentary eye is filled with dark pigment sufficient to arrest the development of the eye, but red light causes no pigmentation in the skin, and only under the influence of this chemically inactive light is regression overcome.

The development of the nuptial pad in the male *Alytes*, midwife toad, which passes its mating period in water, is not found on those individuals which mate on land, where no trace of a pad is discernible, yet it can be made to appear by compelling them to mate in water like other European batrachians. This is done by raising the temperature, when the mating animals stay longer in the water than usual, otherwise they would be dried up; later in life compulsion is unnecessary, they take to water of their own accord when desirous of mating.

In 1914 experiments were carried out on the Ascidian, *Ciona intestinalis*; if the siphons, the inhalent and exhalent tubes, are cut off, they grow larger than before; repeated amputations produce specimens in which the siphons present a jointed appearance. The offspring of these individuals have longer siphons, but the jointed appearance has been smoothed out; that is, the regeneration is not transferred to the progeny, but the locally increased intensity of growth is so.

During the war the experimental animals whose pedigree was known, and had been followed for fifteen years, were lost.

The President having opened the discussion, Prof. E. W. MacBride, F.R.S. (visitor) explained that, as Prof. Kammerer would reply to any criticisms in German, he would gladly act as his interpreter.

Dr. W. BATESON, F.R.S., having complimented the lecturer on his enthusiastic devotion to his subject, dissented from several of his conclusions.

Mr. J. T. CUNNINGHAM (visitor) said that he was not altogether in agreement with Dr. Kammerer, nor with the criticisms made by Dr. Bateson. He maintained that adaptive characters have nothing to do with specific characters, and that species are not distinguished by adaptations. He thought that Dr. Kammerer's evidence was not presented with sufficient precision, and the relation between the external stimuli and the results described has been left too vague, as in the case of *Alytes*. In *Proteus* and *Salamandra* that is not the case, but the evidence of heredity in the latter case is somewhat vague. In *Proteus* the increase of the eye under the action of light is evidence that the reduction of the eye in evolution was due to the absence of light.

Prof. E. S. GOODRICH, F.R.S., Sec.L.S., while admiring the interesting results of Dr. Kammerer, was not satisfied as to his interpretations. For instance, the reappearance of the large eye in *Proteus* on the application of red light seems to prove that the factors of inheritance necessary for their production remained unchanged during the long period in which *Proteus* has lived in the dark since its large-eyed ancestor first entered the caves.

The lecturer replied, Prof. MacBride acting as interpreter. He submitted that the criticisms of Dr. Bateson and Mr. Cunningham were irrelevant, and remarked that control experiments would be carried out in Cambridge. The number of individuals subjected to his experiments varied from as few as twenty to as many as a hundred in different cases.

May 24th, 1923.

*Anniversary Meeting.*

Dr. A. SMITH WOODWARD, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 10th May, 1923, were read and confirmed.

Mr. William Henry Wilkins, Dr. Clarence Tierney, and the Rev. Rosslyn Bruce, D.D., were admitted Fellows.

Mrs. Nora Lilian Alcock was proposed as a Fellow.

The Treasurer made his Annual Report on the Accounts of the Society, and the Statement (see pp. 24-26), duly audited, was received and adopted.

The General Secretary reported that since the last Anniversary the following had died or their deaths been ascertained, namely:—

14 Fellows.

Sir Isaac Bayley Balfour.	John Henry Gurney.
Arthur Wells Bawtree.	Lawrence Lewton-Brain.
John Lewis James Bonhote.	Dr. James Charles McWalter.
Dr. William Carruthers.	Most Rev. Samuel Tarratt de
Sir Ernest Clarke.	Terrot Nevill, D.D., Bishop
William Edward de Winton.	of Dunedin & Primate of
Henry John Elwes.	New Zealand.
Thomas Bennett Goodall.	Frederic Newton Williams.
Dr. Ralph Gooding.	

3 Associates.

William Cole. William Henry Pearson. William Barclay.

1 Foreign Member.

Prof. Gaston Eugène Marie Bonnier.

That the following 16 Fellows had withdrawn:—

Charles Alfred Barber.	Harold Warren Monington.
Dr. Paul Andries van der Bijl.	Phra Vanpruk Picharn.
Rev. Alfred John Campbell.	Mrs. Mary Ross Hall Pole-
Mrs. Maud Hands ( <i>née</i> Samuel).	Evans ( <i>née</i> Thomson).
Dr. Marcus Manuel Hartog.	Jesse Reeves.
Stuart Hogg.	Charles Francis Massey Swyn-
Sir Frederick John Jackson,	nerton.
K.C.M.G., C.B.	Harold Stuart Thompson.
Edmund Gustavus Bloomfield	Prof. Robert Wallace.
Meade-Waldo.	Dr. Richard Norris Wolfenden.

During the same period 31 Fellows have been elected, of whom 26 have qualified up to the present. Also 1 Foreign Member and 2 Associates have been elected.

The Librarian's report was read, showing that donations from private individuals and editors amounted to 229 volumes and 483 pamphlets and parts, by exchange 197 volumes and 683 detached parts, by purchase 183 volumes and 235 parts; in all, the accessions amounted to 609 volumes and 1401 pamphlets and separate parts. Books bound amounted to 685: 75 in buckram, 245 in half-buckram, 198 in cloth, and 167 rebacked.

The General Secretary having read the Bye-laws governing the Elections, the President opened the business of the day, and the Fellows present proceeded to vote for the Council.

The Ballot for the Council having been closed, the President appointed Mr. H. N. Ridley, Mr. W. S. Rowntree, and Mr. R. Paulson, Scrutineers, who, having examined the ballot papers and cast up the votes, reported to the President, who declared the result as follows:—

\*Dr. W. BATESON, F.R.S.; Dr. GEORGE P. BIDDER, M.A.; \*R. H. BURNE, Esq.; Dr. WM. THOS. CALMAN, F.R.S.; Prof. FELIX E. FRITCH, D.Sc.; Prof. E. S. GOODRICH, F.R.S.; Prof. Dame HELEN GWYNNE-VAUGHAN, D.B.E.; Sir SIDNEY F. HARMER, K.B.E., F.R.S.; Dr. ARTHUR WM. HILL, F.R.S.; Dr. B. DAYDON JACKSON; \*L. V. LESTER-GARLAND, M.A.; HORACE W. MONCKTON, F.G.S.; JOHN RAMSBOTTOM, M.A.; Dr. A. B. RENDLE, F.R.S.; The Rt. Hon. LIONEL WALTER, Baron ROTHSCHILD, F.R.S.; Dr. E. J. SALISBURY; THOMAS ARCHIBALD SPRAGUE, B.Sc.; \*R. J. TABOR, B.Sc.; \*Prof. F. E. WEISS, F.R.S.; and Dr. A. SMITH WOODWARD, F.R.S.

(New Councillors are shown by an asterisk. The retiring Councillors were: Prof. MARGARET BENSON, D.Sc.; E. T. BROWNE, M.A.; G. W. E. LODER, M.A.; FRANK A. POTTS, M.A.; and C. E. SALMON, Esq.)

The Ballot for the Officers having been closed, the President appointed the same Scrutineers, who, having examined the ballot papers and cast up the votes, reported to the President, who declared the result as follows:—

*President.* Dr. ALFRED BARTON RENDLE, F.R.S.  
*Treasurer.* HORACE W. MONCKTON, F.G.S.  
*Secretaries.* Dr. B. DAYDON JACKSON.  
 Dr. W. T. CALMAN, F.R.S.  
 JOHN RAMSBOTTOM, M.A.

The President then delivered an Address, which was illustrated with lantern-slides (see p. 27).

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## TREASURER'S ACCOUNTS FOR THE YEAR ENDED APRIL 30TH, 1923.

(Presented at the Anniversary Meeting, May 24th, 1923.)

*Receipts and Payments of the Linnean Society from May 1st, 1922, to April 30th, 1923.**General Account.*

	£	s.	d.		£	s.	d.
To Balance at Bankers on 1st May, 1922 .....	625	6	8	By Taxes and Insurance .....	27	12	5
" Cash in hand .....	4	7	10	" Repairs and Furniture .....	209	3	8
" Interest on Investments .....	355	17	11	" Coal, Electric Current, and Gas .....	119	2	0
" Admission Fees .....	198	0	0	" Salaries .....	947	15	0
" Annual Contributions .....	£2228	4	0	" Library:—			
do. Goodenough Fund... ..	4	0	0	Books (New Books £34 18 8).....	£259	5	0
	2232	4	0	Binding.....	172	13	2
	385	14	6	" Expenses of Publications:—			
" Sales of Publications:—				Printing .....	£875	13	4
Transactions .....	£124	13	8	Illustrations .....	212	9	7
Journals .....	255	4	7	Distribution .....	51	8	4
Proceedings and Catalogues .....	5	16	3	" Miscellaneous Printing and Stationery .....	1112	11	3
	385	14	6	" Petty Expenses (including Tea and Postage) .....	249	19	1
" Fellows' postal account, deposits .....	16	12	2	" Fellows' postal account .....	142	0	6
" Donations in aid of Publications .....	71	0	0	" Linnean Medal .....	15	0	0
" Miscellaneous Receipts .....	55	0	5	" Transfer to Separate Account .....	24	11	7
" Fractional Surplus on conversion of Midland Railway Stock.....	0	7	11	" Balance at Bankers, 30th April, 1923 £513 9 3*			
				Do. deposits, Fellows' postal account .....	94	4	2
				" Cash in hand.....	7	4	4
	£3924	11	5		614	17	9
	£3924	11	5		£3924	11	5

\* £322 already allocated for printing in hand.



*Separate Account.*

	<i>f. s. d.</i>	<i>f. s. d.</i>
To Balance at Bankers, 1st May, 1922:—		
Westwood Fund .....	£12	4 10
Trail Award Fund .....	9	18 8
Crisp Award Fund .....	33	16 2
Hooker Lecture Fund .....	63	11 11
Tagart Fund .....	38	18 0
Goodenough Fund .....	18	4 10
Library Catalogue Fund .....	87	8 5
Annual Dinner Fund .....	3	7 6
	<u>267</u>	<u>10 4</u>
Donations:—		
Goodenough Fund .....	£6	0 0
Library Catalogue Fund .....	17	2 0
Tagart Fund .....	1	0 0
	<u>24</u>	<u>2 0</u>
Annual Dinner Fund Receipts .....	28	17 6
Interest on Investments:—		
Westwood Fund .....	£9	2 4
Trail Award Fund .....	3	13 0
Crisp Award Fund .....	6	19 10
Hooker Lecture Fund .....	22	0 10
Tagart Fund .....	21	19 1
Goodenough Fund .....	5	1 0
Library Catalogue Fund .....	0	11 0
	<u>69</u>	<u>7 1</u>
Library Catalogue Fund:—		
Transferred from General Account .....	24	11 7
Tagart Fund:—		
Sale of £50 Victory Bond to Library Catalogue Fund .....	45	0 0
	<u>£459</u>	<u>8 6</u>
By Purchase of £50 Metropolitan Water Board 3 per cent. "B" Stock (Goodenough Fund) .....	20	1 6
By Library Catalogue Fund, Purchase of Stock ...	45	0 0
Purchase and Binding of Books (Tagart Fund) ...	104	19 1
General Account from Goodenough Fund .....	4	0 0
Hooker Lecture Fund:—		
Award to Lecturer .....	26	5 0
Cost of Printing Lecture .....	44	2 1
	<u>70</u>	<u>7 1</u>
Cost of Annual Dinner .....	32	5 0
Balance at Bankers, 30th April, 1923:—		
Westwood Fund .....	£21	7 2
Trail Award Fund .....	13	11 8
Crisp Award Fund .....	40	16 0
Hooker Lecture Fund .....	15	5 8
Tagart Fund .....	1	18 0
Goodenough Fund .....	5	4 4
Library Catalogue Fund .....	84	13 0
	<u>182</u>	<u>15 10</u>



## PRESIDENTIAL ADDRESS, 1923.

A HUNDRED years ago yesterday a few Fellows of the Linnean Society met to discuss and adopt a series of rules for a Zoological Club which it had been decided to form within the Society. It was apparently thought that some of the more technical communications on comparative anatomy and on British zoology could be received and discussed more satisfactorily by a small body of specialists than by a general meeting of the Society. The question of zoological nomenclature even then was also agitating the Fellows, and this subject was relegated to the select small circle so early as 1825. The Club, however, with its separate meetings, never received much support. The minute book records that on several occasions there was no quorum to form a meeting; and in 1827 when the Honorary Secretary, Mr. N. A. Vigors, left to become Secretary of the newly formed "Zoological Institution" (as it was then termed), the Club gradually declined until in November 1829 it came suddenly to an end without any formal closing. From that time onwards those who wished to pursue zoology separately and intently joined the "Scientific Committee" of the then chartered Zoological Society, and the Linnean was left to pursue its old course. During the past century our Society has been actively engaged in biology in its widest sense; and while publishing purely technical papers on both botany and zoology, it has always fostered discussions in which the devotees of both these branches of biological science could effectively take part. With a larger Fellowship than at any previous time, and with more numerously attended meetings, the Society still takes the broad view which it inherits from the illustrious Linnaeus, and the modern problems of heredity and mendelism—indeed all the factors and phenomena of organic evolution—can best be treated here. During the past session, to name only two examples, we have published Prof. Garstang's examination of the theory of recapitulation (or Haeckel's biogenetic law), and we have received and discussed Dr. Kammerer's masterly account of his experiments which he considers to prove the inheritance of acquired characters.

These comprehensive discussions particularly interest a palæontologist because he tries to recover the actual documentary evidence of the history of the world of life and is thus concerned in tracing lineages. He still adopts the Linnean plan of nomenclature as a matter of convenience. His use of specific, generic, and family names approximates indeed more closely to the broad conception of Linnaeus than to the narrower sense in which they are now usually applied to the classification of existing plants and animals. Sometimes, however, he feels that this nomenclature scarcely expresses his meaning. Many of his so-called genera include species derived from more than one lineage; many of his

so-called families are also polyphyletic; and it would be more convenient if he could devise a nomenclature which would not only indicate the lineage but also the stage of evolution therein. He deals in fact with slowly changing grades which are approximately the same in each parallel lineage of a group as it is traced through successive periods of time. His ideal definition of any category includes not merely the usual diagnostic characters, but also a statement of tendencies in evolution. He has already applied this method of classification to certain ammonites and brachiopods with much success; and, where each individual retains the whole of its skeleton from early youth to old age, the method is often easily applicable.

As concrete instances of these lineages, which have now been well studied, may be mentioned those of the ammonites, graptolites, Cretaceous polyzoans, and Palaeozoic corals. Equally important are the parallel lineages which have been recognised among several groups of Tertiary mammals. On the whole, perhaps, the case of the graptolites is the simplest illustration to begin with and may be most concisely stated\*.

In the earliest known graptolites the polyps are arranged on an irregularly branching skeleton, often forming a hard network. The thecae, or cells which lodged the polyps, are varied in shape and evidently show that these primitive skeletons belong to several genera or species. Somewhat later, graptolites with many symmetrically arranged branches make their appearance; and it is to be noted that the symmetry of the arrangement would be advantageous in tending to ensure an equal supply of food to each branch. Next, there appear successively eight-branched, four-branched, and two-branched forms. Eventually, just before the race becomes extinct, nearly all the graptolites are simple rods. In each of these grades the variety in the shapes of the thecae is at least as great as in the primitive ancestors. Presumably therefore each of the original types has independently followed the same trend of evolution, successively producing colonies of the same simplified shape. The Tetragraptids, Diplograptids, and Monograptids, therefore, are not respectively true genera as was originally supposed when they were named; they are merely corresponding stages in the evolution of several parallel groups, which were all striving towards a more effective and uniform distribution of food to the colony.

The case of the Palaeozoic corals has lately been illustrated by an instructive diagram by Dr. W. D. Lang †. In each lineage, as distinguished by the characters of its septa, tabulæ, etc., the initial simple coral first begins to form a loose cluster. Somewhat

\* H. A. Nicholson & J. E. Marr, "Notes on the Phylogeny of the Graptolites." *Geol. Mag.* [4] vol. ii. (1895), pp. 529-539. Also Gertrude L. Elles, "The Graptolite Faunas of the British Isles." *Proc. Geol. Assoc.* vol. xxxiii. (1922), pp. 168-200.

† W. D. Lang, "Trends in British Carboniferous Corals," *Proc. Geol. Assoc.* vol. xxxiv. (1923), p. 122.

later the cluster becomes compacted, so that the corallites are elongated and in close contact. Next the colony is compressed, so that they become hexagonal in section. Finally, the walls between the individual corallites disappear, and the septa of one are continuous with some of those of its six neighbours. Whenever the complete lineage can be traced this is proved to be the inevitable succession of skeletal forms.

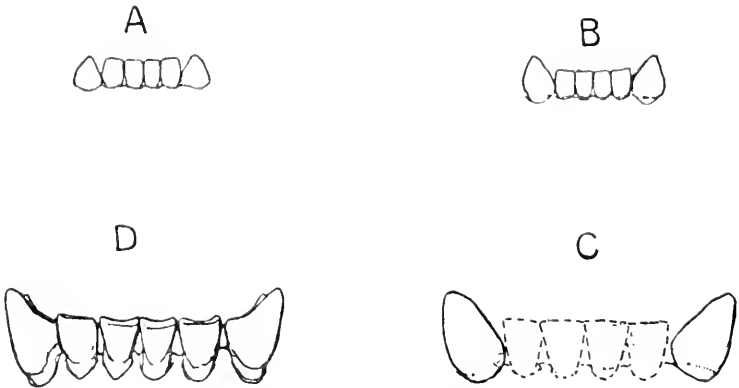
The first lineages to be studied in detail were those of the ammonites, described by the late Alpheus Hyatt. He recognised that as each lineage progressed, and as the successive shells acquired new characters, they invariably passed through the stages represented by their predecessors before they reached this higher plane. The earlier stages might be abbreviated—some might even be omitted—still there was evidence of them, and they were merely slurred over so that the later adult characters might be hurried on. Subsequent studies of lineages of ammonites by other authors have entirely confirmed Hyatt's conclusions, and the same results have been obtained more recently by the examination of many other groups of fossils.

The tracing of lineages among vertebrates, especially mammals, has afforded repeated examples of the recapitulation of ancestral characters in the immature stages of organisms. Sometimes they can only be detected by close observation, but they are nevertheless evident when pointed out. Even among the scanty fossils representing the lineage of man, there seems to me to be one discovery definitely proving a case of recapitulation in the modern human skeleton, and as this has not hitherto been sufficiently appreciated, I wish to emphasise it by a new diagram (fig. 1). Many years ago the late Joseph Leidy pointed out that among the extinct ancestral horses the milk or temporary dentition of a genus always more closely resembled the permanent dentition of its predecessor in the lineage than did the permanent dentition of the same genus. In other words, the temporary dentition of the later and more advanced genus repeated some of the features of the final dentition of the immediately preceding genus. The later type retained the old pattern in its temporary dentition, but progressed forwards in having a more effective grinding dentition for its adult career. If the primitive human skull found at Pilt-down, Sussex, be regarded as belonging to the immediate predecessor of modern man, exactly the same phenomenon is observable in him. The temporary lower canine tooth of modern man very closely resembles in shape the permanent lower canine tooth of the fossil Pilt-down man; and to retain its apex at the level of the crown of the adjacent teeth in the immature modern jaw it is never completely extruded (fig. 1 A). If the base of its crown were raised to the same level as that of the adjacent teeth (fig. 1 B), it would be prominent and interlock with the upper canine to the same degree as in Pilt-down man (fig. 1 C) and equally approach the ape-pattern (fig. 1 D). Modern man is thus

proved to have advanced beyond his immediate predecessor in at least one important character, but in his immature state he retains that character in a slightly modified form.

The paleontologist, therefore, is convinced that whenever he is able to trace lineages he finds evidence of the recapitulation of ancestral characters in each life history; and he fails to appreciate the subtleties of logic of those who argue the question from the comparatively narrow standpoint of the study of existing life. He is equally convinced that the phenomena he observes when tracing lineages can only be explained by assuming that acquired characters are inherited. He finds a gradual advance towards complete harmony with the environment in successive forms—adaptations to sufficiency of feeding, to effectiveness in locomotion,

Fig. 1.



Diagrammatic front views of the lower incisors and canine teeth, showing that if the milk dentition of modern Man (A) were modified by the complete extrusion of the canines (B), this would resemble the permanent dentition of Piltown fossil Man (C) more closely than does the permanent dentition of any Ape, such as the Chimpanzee (D); three-quarters nat. size.

and so forth; and it is difficult to believe that these steps forward are not influenced by the struggle of successive generations with the conditions under which they live. Kammerer's experiments on living animals are said to prove that newly acquired characters are not always inherited in the same manner as more deeply ingrained characters—that, in fact, they differ in not fulfilling the Mendelian expectation. A paleontologist, studying lineages, will welcome this result if it can be substantiated, for he often notes rhythm in evolution—unequal rates of progress—which may imply that under certain circumstances some characters may need repeated acquisition in a longer series of generations than others before they become part of the permanent inheritance.

The greatest difficulties are met with in discovering the beginnings of any lineage and the fundamental points of divergence. I have already alluded to some of these difficulties in previous addresses when referring to certain fossil fishes, and I wish now to mention three other striking instances which have lately been studied.

The Ichthyosauria, or fish-shaped reptiles, which seem to have lived in all seas throughout the Mesozoic era or "age of reptiles," appear suddenly in the Trias of both Europe and North America and Spitzbergen with their adaptations to strictly aquatic life almost complete. These early forms only differ from later Ichthyosauria in retaining more traces of their land ancestry, such as the less deep overlapping of the bones in the skull, the less uniform shape of the teeth, and the greater elongation of the humerus, radius, and ulna in the fore limb. It must also be noted that they are all of comparatively small size. Some have the fore limb or paddle rather elongated (longipinnate), others have it rather broad (latipinnate), and in his recent monograph of the Ichthyosauria \* Baron von Huene points out that each of these types begins a lineage which can be traced throughout the life history of the group until its end at the close of the Cretaceous period. The progressive changes in these two lineages are comparatively small. The bones of the skull soon become very deeply overlapping, as in fishes and cetaceans, the teeth attain uniformity and are implanted in a groove, and the vertical tail fin acquires maximum effectiveness. It can only be observed that towards the end of the Jurassic period the jaws sometimes become toothless in the adult, the fore limbs are changed into more flexible paddles by the persistence of much cartilage round the bones in the digits, and the lower lobe of the tail becomes more flexible by the attenuation of the end of the vertebral axis which supports it. Ichthyosaurs are, indeed, in all essentials the same from the beginning to the end, and although Baron von Huene supposes that the small Mesosaurians of the Permian period may perhaps represent their semi-aquatic ancestors, there is only slight basis of fact for this hypothesis. With our present knowledge their origin remains a mystery.

The Pterosauria, or flying reptiles, have the same range in time as the Ichthyosauria, and also exhibit remarkable uniformity. Only a single skeleton has hitherto been found in the Trias, the so-called *Tribesodon* from northern Italy, so that the earliest member of the group is imperfectly known. The specimen has been studied lately by Baron F. Nopcsa †, who finds that in every character which can be observed it is a well-formed Pterosaurian. Its fore limbs are already efficient wings, and the hind limbs only

\* F. von Huene, "Die Ichthyosaurier des Lias und ihre Zusammenhänge." Berlin, 1922.

† F. Nopcsa, "Neubeschreibung des Trias-Pterosauriers *Tribesodon*." Palæont. Zeitschr. vol. v. (1922), pp. 161-181, pl. ii.

appear to differ from those of the later flying reptiles in being relatively large. As the group is traced upwards in time some of its members are progressively larger, until just before its extinction at the end of the Cretaceous period it is represented by *Pteranodon*, with a wing-span of 20 feet or more, the largest flying animal which ever existed. In the course of this evolution some of the Pterosauria become toothless, like *Pteranodon* itself, but the only essential change is a firmer fixation of the wings and a reduction of the clawed digits to mere splints on the wing finger. From its very beginning, so far as our present knowledge extends, the Pterosaurian was an efficient glider or flier, and no real clue to its ancestry has hitherto been found.

Finally, consider the origin of the Mammalia. Paleontologists pride themselves on having found during recent years almost every gradation between certain skeletons of the Permian and Triassic Theromorph reptiles of South Africa and the skeleton of the monotreme mammals. The series is, indeed, now remarkably complete and convincing. There can be no doubt, from the discovery of a few isolated jaws and limb bones both in Europe and North America, that representatives both of these lowly mammals and even of marsupials were widely spread during the latter half of the Mesozoic era. They are still better known by comparatively specialised forms in deposits dating back to the very beginning of the Tertiary era both in Europe and in North America. Nearly all of them then suddenly disappear in both countries, and they are replaced by typical placental mammals, already differentiated into several modern groups, which seem to have no connection with the primitive mammals which immediately preceded them in the same regions. At this stage, therefore, there is a complete gap in the series; and even if the earliest mammals can be clearly traced back to antecedent reptiles in South Africa, the higher mammals characteristic of the present world still appear without any recognisable ancestors.

A possible explanation is that each new lineage began as a rapid development in one community in a locality of restricted extent. In this case its initial stages would be represented by comparatively few fossils in a small area, or none of them may have been preserved owing to local unfavourable circumstances.

It is already known that there were such rapid local developments. The earliest stages of the elephants, for example, are found only in Egypt, and they are represented by so variable a series of forms that it is difficult to classify them. They are also accompanied by strange mammals more or less related to ancestral elephants. The region of which modern Egypt is now a part seems, therefore, to have been the place of origin of the elephant-lineage. Another strange and rapid development occurs in the Middle Eocene rocks of Wyoming, where the small-brained *Dinocerata* suddenly arose in many forms, but as suddenly died out without ever spreading. The local development and sudden end



of the gigantic rhinoceros like *Baluchitherium* and its allies in central Asia are also noteworthy in the same connection.

If, however, there seems to be some hope of discovering the beginning of the various lineages when exploration has proceeded further, the difficulty of explaining their end appears to be as great as ever. As soon as they have attained their widest geographical range, have become perfectly well adapted to their environment, and are represented by the largest individuals, they begin to show signs of decline and disappear at least as rapidly as they originated. Indeed, in a modified sense, Cuvier's early theory of the successive "revolutions of the globe," which have culminated in the world of life as it now exists, is still distinctly plausible. The ancestors of the crustaceans and arachnids, for example, when they held the foremost place at the beginning of the Devonian period, attained their largest size—some with a body six feet in length—just before the dominance of fishes, which at first were comparative dwarfs. Many of the reptiles, too, immediately before they lost their dominant position at the end of the Cretaceous period, were among the largest animals that ever lived; and when these disappeared, there was for a long period among the mammals which replaced them no animal larger than a sheep. The alternating luxuriance and poverty in the development of life in successive phases is indeed striking, and at present baffles explanation.

Most remarkable, perhaps, is the fact that we rarely find any evidence of direct competition between the flourishing type that is doomed and the incipient higher type that is destined to replace it. For example, so far as we know, the Ichthyosaurians, Mosasaurians, and other giant sea-reptiles, which ranged in abundance through all seas from the Arctic regions to New Zealand, never came in contact with the whales and porpoises which were eventually to take their place. Fossils already discovered in Egypt suggest that the toothed whales originated from primitive land-carnivores after the old sea-reptiles had disappeared. When, however, this new race passed into the vacant seas, it soon multiplied and spread widely; and by the end of the Eocene period there were toothed whales (*Zeuglodon*) some 70 feet in length.

The solution of the problems suggested by these various facts is delayed and rendered all the more difficult by the astonishing uniformity in the geographical distribution of life in past ages. When the corresponding fossil-bearing rocks in different parts of the world are explored, there is as a general rule very little difference in their contained faunas and floras. When Ameghino, for instance, first found reptiles and fishes in a Jurassic stratum in Patagonia, he sent me a skull of a sea-crocodile (*Metriorhynchus*) and a skull of a predaceous ganoid fish (*Hypsocormus*), such as might have been found similarly associated in the Middle Jurassic Oxford Clay at Peterborough in England. When I received the

first Triassic fishes from New South Wales, Australia, and from Spitzbergen, I found the peculiar ganoid *Belonorhynchus* conspicuous in both these localities. When the 'Discovery' expedition met with fish-remains in the Devonian rocks of Antarctica, they collected very little which might not have been found in the corresponding formations in Scotland. During recent years the discoveries of fossil vertebrates in the west of North America, which yielded so many novelties at the end of the last century, have become comparatively monotonous. They are merely perfecting our knowledge of known types and revealing endless variants of the same. Even the preliminary reports on the fossil vertebrates lately discovered by the Russians and Americans in Central Asia do not promise the rich harvest of novelties which it was hoped to obtain from that interesting region. It is necessary, indeed, still to depend for real progress on finding the records of local accidents--oases in the dreary desert of uniformity. Dr. C. D. Walcott added a whole chapter to our knowledge of the earliest marine fauna by his discovery of a deposit of greasy shale which could preserve soft-bodied animals among the Cambrian formations in the Rocky Mountains of Canada. The prospectors for oil, now visiting and studying the remotest corners of the globe, are also giving valuable help in discovering exceptional formations and localities which palaeontologists may profitably explore further. We have to depend on accidental help of this kind from many sources when we are looking for fossils of the most fundamental import.

In ending now my term of office, it only remains for me to thank the Fellows of the Linnean Society for the great honour they did me four years ago when they first elected me to be their President. I also wish especially to express my appreciation of the kind help and forbearance of my fellow Officers, the Council, and Permanent Staff for the period during which I have served. It was just over forty years ago that I began to attend the meetings of the Society, and since I became a Fellow it has been one of my greatest pleasures to be closely associated with its work. After holding the highest office for the full term, I have the final gratification of handing it over to an old friend and valued colleague, the distinguished botanist whom you have chosen to be your President to-day. I not only wish him all success, but hope that he too will carry away happy memories such as those which I shall retain for the rest of my life.

CANON G. R. BULLOCK-WEBSTER then moved: "That the President be thanked for his excellent address, and that he be requested to allow it to be printed and circulated amongst the Fellows," which, after being seconded by Mr. A. H. MAUDE, he put to the meeting and reported carried.

The President having acknowledged the Vote of Thanks, proceeded to address Sir JAMES ALLEN,—

The Council of the Linnean Society has this year awarded the Linnean Gold Medal to Mr. THOMAS FREDERIC CHEESEMAN, to express its high appreciation of the valuable services rendered by him to botanical science through his life-long study of the vegetation of the most distant portion of our overseas dominions.

When Mr. Thomas Kirk died in 1897, botanists learned with regret that he had made very little progress with the "Students' Flora of New Zealand," on which he had been engaged. They felt, however, that it was a matter for congratulation when they received the news that the Government of New Zealand, realising the importance of preparing a complete Flora of the Dominion, had commissioned Mr. Cheeseman to continue and complete the work, and relieved him of his official duties as Curator of the Auckland Museum to enable him to do so. Mr. Cheeseman's arduous preparation for his task is modestly summed up by himself in the Introduction to his "Manual of the New Zealand Flora," where he states that he began his original researches in 1870, and personally examined almost the whole country from the Kermadec Islands and the North Cape to Otago. Mr. Cheeseman's completed work, published in 1906, is regarded by all who have used it as one of the best manuals of its kind. His two large volumes of "Illustrations," published in England in 1914, with the editorial help of another of our Fellows, Dr. W. B. Hemsley, are also of great assistance to the student of the New Zealand Flora.

Mr. Cheeseman has further devoted attention to the Flora of the Subantarctic Islands of New Zealand, and he contributed a systematic account of the Flowering Plants and Ferns to the publication on these Islands edited by Dr. Chilton. To his recent description of the Vascular Flora of Macquarie Island, which forms one of the Reports of the Australian Antarctic Expedition (1911-14), he has added an interesting and suggestive discussion of the origin and affinities of the Antarctic Flora.

Mr. Cheeseman's services to science, however, are not limited to botany. As Curator of the Auckland Museum for many years, he has not only covered a wide field in Natural History, but has also made important contributions to Ethnology. He has brought together a unique collection illustrating the past history and customs of the disappearing Maori civilization, and has become a leading authority on the subject.

In asking you to convey to Mr. Cheeseman this token of our admiration and esteem, I think it is interesting to note that on the 19th of next month, before the medal can reach him, he will have completed his fiftieth year of Fellowship of our Society.

The High Commissioner suitably acknowledged the award, which he felt would be greatly appreciated throughout the Dominion of New Zealand, and undertook to transmit the medal to Mr. Cheeseman.

The General Secretary having placed on the table the obituaries of deceased Fellows, the proceedings terminated.

### OBITUARY NOTICES.

After several months of illness consequent upon an overstrained heart, the result of unremitting labour in his Edinburgh position, SIR ISAAC BAYLEY BALFOUR, K.B.E., passed away at Courts Hill, Haslemere, on the 30th November, 1922. The son of John Hutton Balfour, Professor of Botany at Edinburgh from 1845 to 1879 (known to generations of students as 'Woody Fibre'), he was born in that city on the 31st of March, 1853, was educated at Edinburgh Academy, in turn passing through the Universities of Edinburgh, Strassburg, and Würzburg—his inherited tendency to botany being thus thoroughly called forth and trained; and besides taking D.Sc. at Edinburgh, he matriculated also in the faculty of medicine.

In 1874, whilst still an undergraduate, he was attached to the party which in 1874 proceeded to Rodriguez to observe a transit of Venus, and brought home his first foreign botanical collections. Resuming his medical studies, he graduated M.B. in 1877, proceeding to M.D. in due course in 1883; for botanic purposes he studied abroad as already mentioned.

He was appointed Professor of Botany at Glasgow in 1879, at the early age of 26; the next year he went to Socotra, there making ample collections, which took several years to work out. When practically complete, he offered his results for publication in our Transactions, but stipulated that they should not be published in successive parts, but in a volume. This could not be done as demanded, but the author succeeded in inducing the Royal Society of Edinburgh to publish the well-known substantial volume in 1888, of 446 pages and 100 quarto plates, forming vol. xxxi. of the Transactions of the Edinburgh Society.

Before this volume appeared, he was appointed Sherardian Professor of Botany at Oxford, and soon made his presence felt. The old connection of the Baxters was ended, the younger Baxter leaving. The arrangement of the beds was altered, and other changes were rapidly made, as for instance, in the herbarium, where the volumes of the Du Bois collection were cut up, and the sheets distributed amongst their congeners in the general herbarium. Happily the Morisonian and Dillenian collections were spared the like fate, but his presence was a stimulus after the tranquil reign of Prof. M. A. Lawson.

After four years in Oxford he migrated to Edinburgh, in succession to Alexander Dickson, becoming also Queen's Botanist for Scotland, and Regius Keeper of the Royal Botanic Garden in Inverleith Row, which he retained for 34 years.

During his active professorial life he added to his previous writings, but chiefly throwing his energies into the improvement of the gardens at Inverleith Row, and in working up such genera as *Primula* and *Rhododendron*, in which he became *facile princeps*. His earliest publication in our issues was an extract from a letter on the Rodriguez flora (Journ. Bot. xv. (1875)), followed by a new genus of Turneraceæ, *Mathurina*, in the same volume (1876). After describing some new plants from the same locality in the subsequent volume, he issued an excellent monograph of the genus *Halophila* in the Transactions of the Edinburgh Botanical Society, and then in our 17th volume of the Journal (Bot.) brought out a complete monograph of the Screw-pines, *Pandanus*. Smaller papers followed from time to time, during the period when he was in Socotra and working up its flora; latterly his chief contributions have been in the 'Notes' of the Edinburgh Botanic Garden.

Elected Fellow of our Society, 16th December, 1875, he served on our Council during 1884-85; Fellow of the Royal Society in 1884, and on its Council 1892-94. He formed part of the Departmental Committee of H.M. Treasury, which sat from 1900 to 1901, reporting H.C. 1901, no. 205. He did important work in editing certain German works, translated by the Rev. H. E. F. Garnsey, such as De Bary's 'Fungi, Mycetozoa and Bacteria' (1887); Sachs's 'History of Botany' (1890), and Goebel's 'Outlines of Classification and Special Morphology of Plants' (1887); and his labours in the establishment and early share in the editorship of the 'Annals of Botany' were notable.

Last year, finding the climate of Edinburgh trying to his health, he quitted Inverleith House, in the Botanic Garden, and came south to the milder climate of the Surrey hills, establishing himself on Courts Hill, above the town of Haslemere, and hoping to enjoy the scientific society of London. But that project was not to be realized; hardly had he arrived, when he was confined to his bed by medical orders, and although he rallied so much as to be taken out in a bath-chair, there remained no hope of a real cure, and he passed hence on the last day of November, 1922. [B. D. J.]

GASTON EUGÈNE MARIE BONNIER, Professor at the Sorbonne, Paris, was born in the year 1855, in Paris, where he passed his early years and received his education. For 14 years he remained in the École Normale, rue d'Ulm, as pupil preparer, assistant lecturer, and finally lecturer. In the laboratory attached to this school, Bonnier carried out his first experiments. In 1887, at the age of 32, he was summoned to succeed Duchartre in the chair of botany in the Faculty of Science, and there he displayed the same

powers of organization as in the school. When he entered upon his duties, his only materials were dried or preserved plants; but ultimately he succeeded in getting possession of some ground for the cultivation of plants and the building of a laboratory on the borders of Fontainebleau.

The year 1889 witnessed the foundation of the 'Revue générale de Botanique,' which is now in its 34th volume; from 1879 he issued a multitude of articles, together with some in collaboration with L. Mangin or C. Flahault. Perhaps the most striking item in his strenuous labours is his 'Flore complète illustrée en couleurs de France, Suisse, et Belgique,' of which six quarto volumes have been issued, from Ranunculaceæ to Compositæ.

He was elected on the 6th May, 1920, a Foreign Member, but his connection with our Society was short: he died in Paris on the 20th December, 1922, and was buried on the 2nd of January last. [B. D. J.]

DR. WILLIAM CARRUTHERS, F.R.S., Past-President of the Linnean Society during 1886-90, and a Fellow since 7th February, 1861, passed away a few days after the completion of his 92nd year.

Born at Moffat on the 29th May, 1830, he was intended by his father, Samuel Carruthers, a retail tradesman, for the Presbyterian ministry, and received his education at Moffat Academy, and Edinburgh University, which he entered in 1845 and was still a student in 1854, when he passed into New College, Edinburgh, for training to the pastoral office. By that time he must have shown special aptitude for natural science, as Professor John Fleming, who taught natural science in that institution, advised him to specialise in science. One of the early recollections of our late Fellow was, that this professor had a Great Auk, *Alca impennis*, in captivity, probably one of the last specimens so kept. Other teachers were John Hutton Balfour, George J. Allman, and John Goodsir, and his prospects of succeeding Fleming in 1858 were good, when John Anderson was appointed to the vacant chair. Forty-five years afterwards Mr. Carruthers discharged those functions at New College during 1903-04.

A short period as botanical lecturer at the New Veterinary College, Edinburgh, and Assistant Secretary to the Royal Society of Edinburgh, was followed by his appointment to the Botanical Department, British Museum, as assistant to J. J. Bennett, recently confirmed as Keeper, after the enquiry in 1860 into the department consequent upon the death of Robert Brown. He remained in this employment until his retirement in 1895, although in 1879 he was an applicant for the Chair of Botany in Edinburgh, when Alexander Dickson was appointed.

An energetic personality was naturally bound to be vigorous, and Mr. Carruthers took his full share in an active and stirring period. He was a pioneer in fossil botany, published discoveries of Graptolites as early as 1858, and the Geology of Moffat in 1859, both

by the Physical Society of Edinburgh, to which he belonged all his life. He published an important paper on *Lepidodendron* and *Calamites* in the Transactions of the Botanical Society of Edinburgh, and the present writer well remembers the presentation of a still more important paper in the old quarters of the Linnean Society at Burlington House, on the 18th of June, 1868, "On fossil Cycadean Stems from the Secondary Rocks of Britain," with its establishment of the genus *Bennettites* in the memoir in our Transactions, with 10 plates, in 1870.

As administrator in the British Museum his work was important, and absorbed his energies previously devoted to research. In 1871 he was appointed Keeper, at a period when the Royal Commission, presided over by the seventh Duke of Devonshire, was enquiring into the position of scientific instruction in Britain, and botany at the British Museum came under severe criticism from two sides: Kew claiming a monopoly of collections, and from the teaching colleges of London. In the end, the Botanical Department of the British Museum remained, and the new keeper proceeded to develop its powers. In the years 1881-3, the collections from the botanical, zoological, and geological departments were removed from the overcrowded galleries at Bloomsbury, to the new building facing Cromwell Road, South Kensington, and thereby the exhibits were more adequately displayed. A special library had to be formed, as the Banksian Library was tenaciously held by the Printed Book Department at Bloomsbury, only certain duplicates being allowed to go westward. Our late Fellow threw himself whole-heartedly into the acquisition of new libraries, namely, a general library common to all the departments from which they could draw, or refer to, consisting of series of volumes of societies' issues which embraced more sciences than one; the other libraries being those required in constant use by the respective departments, and specially relating to their own branch. Mr. Carruthers employed outside assistance to copy the press-marks of the Banksian and later volumes in the Printed Book Department, into a special copy of Pritzel's 'Thesaurus,' ed. II., which he then handed to Mr. Justen, of Dulau & Co., then in Soho Square, who took up the work of getting as many books as possible from home and foreign booksellers; the result being a library of the most extensive and valuable kind, which is still maintained by the Trustees.

Besides his activities in remodelling the Department, Mr. Carruthers in 1871 began his reports to the Royal Agricultural Society as their consulting botanist, on the germinative quality of seeds, plant pests, diseases, and the like, which he continued for 38 years, till 1909.

Elected a Fellow of the Linnean Society on the 7th February, 1861, he lived to be the senior Fellow but one, and was energetic in his services to the Society. He served repeatedly on the Council, 20 years in all, 12 of them as a Vice-President, and the period of 1886-90 as President, his term of office falling

during the hundredth anniversary of the foundation of the Society, and entailing much extra labour for its adequate celebration, which may be read in our Proceedings, 1888-89; on leaving the chair, he was a Vice-President for one year, the last time he served on the Council. Previous to this there was an unpleasant misunderstanding about certain proposals for altering certain Bye-laws, which Mr. Carruthers and others thought would be detrimental to the Society, which led to the then President, Mr. Bentham, abruptly quitting the chair on the 5th February, 1874; at a later meeting matters were adjusted amicably.

In 1889 Mr. Carruthers related his investigations into the portraits of Linnæus; two years later he visited the places where these portraits are preserved, his observations, as he himself said, "after too long an interval" were brought forward at the General Meeting of the 21st June, 1906, printed in our Proceedings, 1905-6, pp. 59-69, pls. 1-8, possibly hastened by the bicentenary festival in Sweden which took place in May 1907. For this Mr. Carruthers was the accredited representative of the Linnean Society, and the veteran of 77 was accompanied by the present writer, who had the gratification of being invited as a personal compliment. During this festival, the degree "honoris causa" of Doctor in the Faculty of Philosophy was bestowed upon Dr. W. Carruthers; he gave an account of his visit to a subsequent meeting of the Society.

After this his liking for science seems to have waned, but he still retained his affection for matters connected with the Presbyterian Church, and for which he edited the 'Childrens' Messenger' for forty-two years. Another subject was his keen interest in the likenesses of eminent Scottish scholars and theologians, especially George Buchanan and John Knox, upon which he published some notes.

The last years of his life he spent in the house of his elder son, Dr. William Carruthers, at Central Hill, Norwood; he died a few days after completing his 92nd year; and it was with keen regret that the writer only received an invitation to pay the last respects to his lifelong friend one day too late, owing to absence from home.

Dr. Carruthers married Jeanie, the eldest daughter of Wm. Moffatt, architect, in Edinburgh. He had two sons and one daughter by this marriage. The younger son died in Kuala Lumpur, and the elder one only survived his father.

In addition to the offices above recited, may be mentioned as borne by our late Fellow, F.R.S. in 1871, F.G.S. in 1867; President of the Geologists' Association in 1875-76, President of the Biological Section of the British Association in 1886, President of the Royal Microscopical Society in 1900-01. [B. D. J.]

By the death of WILLIAM COLE on the 27th June, 1922, the Society lost a notable Associate, and the Essex Field Club a devoted Secretary. He was born at Islington on the 11th of



February, 1844, the sixth son of Julius William Cole, of Kimberton, Huntingdonshire, a Trinity House official, and his wife Frances, granddaughter of John Love, of Crostwick Hall, North Walsham, Norfolk. His education was gained at various private schools, and from evening classes at King's College, Strand. In 1861, when 17, he entered the office of a shipbroker in Mark Lane. His father dying in 1865, the family moved, first to Islington from Tottenham, and next to Clapton, and William entered a barrister's chambers as shorthand writer, and remained five years, and then joined the staff of a newspaper in the same capacity.

Another removal in 1877 to Buckhurst Hill brought him into touch with Epping Forest, and in the beginning of 1880, the Essex Field Club was started. He had been elected member of the Entomological Society in 1873, which he retained to the end of his life; and F.L.S. on the 16th January, 1896, till 15th December, 1910, when he withdrew, and was elected an Associate on that date; this was following a nervous breakdown earlier in the year. A grant from the Royal Society, obtained through his old friend Raphael Meldola, enabled him to travel abroad, and produced an improvement in his health, but he aged perceptibly, and a return of his illness in 1916 was not to be shaken off, and he had to give up much of his activity. In 1919, by favour of some powerful friends, he was granted a Civil List Pension of £50 per annum, and with a further pension of £75 raised by friends, he was able to retire to St. Osyth. The Essex Field Club owes him a debt of gratitude for the unstinted service he gave during a long series of years to its interest; he seemed the personification of the Club.

We are indebted to a sympathetic obituary in the 'Essex Naturalist' for much of the information in the foregoing sketch, and in the same Journal, Oct. 1922-Mar. 1923, will be found a portrait of our late Associate. [B. D. J.]

HENRY JOHN ELWES, F.L.S., F.R.S.—Henry John Elwes was born on May 16th, 1846. He was educated at Eton, served five years in the Scots Guards, and thereafter devoted himself to horticulture, arboriculture, ornithology, entomology, travel, and sport.

In 1891 he succeeded to the estate of Colesborne in Gloucestershire, and there cultivated a great diversity of plants and trees. He had, in 1880, published a fine monograph on Lilies, and became a recognised authority on the genus, but he also cultivated tulips, crocuses, Nerines, and many species of succulents, some of which he had himself introduced.

A very active member, and at one time President, of the Royal English Arboricultural Society, he was responsible for the introduction of several trees into this country, amongst them two of the South American beeches—*Nothofagus antarctica* and *Nothofagus obliqua*, whilst of the Western American larch (*Larix occidentalis*) he was the first to obtain seed of any quantity.

Upwards of 80 plates in the 'Botanical Magazine' represent plants introduced or cultivated by him, the volume for 1877 was dedicated to him by Sir Joseph Hooker, the Editor, "as a tribute to the zeal, intelligence, and success with which you have pursued Horticultural Botany"; and it was chiefly to his initiative that the Magazine owes the fresh lease of life on which it has recently entered.

His great work 'The Trees of Great Britain and Ireland,' in seven volumes, published in collaboration with Prof. Augustine Henry, between 1906 and 1913, was the result of much patient research at home and of many journeys to various parts of the world, undertaken with indefatigable zeal to study the trees in their natural habitats. It is the most comprehensive compilation of its kind, and his name will probably be best remembered as its joint author.

But Elwes also won distinction in the fields of ornithology and entomology, becoming President of the Ornithologists' Union and of the Entomological Society. On both subjects he published many papers, and to the Natural History Museum he presented a fine collection of Lepidoptera. At one time he made a study of primitive breeds of sheep, and accomplished some valuable work in tracing the origin of various breeds. On this subject he published papers in the 'Scottish Naturalist' and other journals. At Colesborne he experimented with as many kinds as he could obtain. To the 'Proceedings' of the Zoological Society, of which he was a Fellow for 56 years, he contributed some fifteen papers on zoological and allied subjects.

He was elected a Fellow of the Linnean Society in 1874, and of the Royal Society in 1896. He was a member of Mr. Macaulay's Mission to Tibet in 1886, and after the Mission had been withdrawn, he explored a new route to that country in company with Mr. Prestage. These experiences drew him into association with Sir Joseph Hooker, with whom he formed a warm friendship, it was therefore fitting that he should be chosen to deliver the first Hooker Memorial Lecture at the Linnean Society in 1913. Much of the country he traversed was described in Hooker's 'Himalayan Journals,' and had not been visited since Hooker's time, though they have been since Elwes journeyed there.

It will be seen that Elwes was a man of very wide interests; the long list of papers under his name in the Royal Society Catalogue of Scientific Literature testifies to this; he was gifted with keen powers of observation, and great energy and tenacity of purpose. He maintained his activities until within a very short time of his death, which occurred at Colesborne on November 26th, 1922, in the 77th year of his age.

Endowed with a splendid physique and a commanding presence, Elwes made his mark wherever he went. He was a good linguist, always ready to communicate information and to assist those engaged in kindred pursuits. A man of strong feelings and

convictions, but with a character such that even those who differed from him most, could not but love and admire him.

Few have been able to command the opportunities or the means he enjoyed, fewer still have put them to better use. He was in the true sense an English gentleman, a sportsman, and a traveller, devoted to the pursuit of Natural Science.

[GERALD W. E. LODER.]

The following came before the Linnean Society:—

1881. 2 June. Indian-made Quinine shown "for" H. J. Elwes.  
 1898. 15 Dec. "Sketch of the Zoology and Botany of the Altai Mountains." J. Linn. Soc., Zool. xxvii. 1899, pp. 23-46, 5 figs.  
 1902. 6 Nov. "Notes on a Natural History Journey in Chile."  
 1913. 4 Dec. Lecture: "The Travels of Sir Joseph Hooker in the Sikkim Himalaya," with specimens, drawings, maps, and lantern slides. [1st Hooker Lecture.]

The MS. was delivered years later, when the second and third Hooker Lectures had been delivered and printed; it was then considered too late to print it. [B. D. J.]

JOHN HENRY GURNEY, styled "The Younger," to distinguish him from his father of the same name, was born at Norwich on the 31st of July, 1848, a native of that county which since the days of Sir Thomas Browne has contributed so many to the ranks of naturalists; to name a few—the founders of the Linnean Society, Sir James Edward Smith was a Norwich man, John Lindley, Sir William Jackson Hooker, Dawson Turner, Alfred Newton, Henry Stevenson, and Thomas Southwell, shed lustre upon East Anglia. He joined the Zoological Society in 1868, two years later, the British Ornithologists' Union, and on the 3rd of December, 1885, he was elected a Fellow of our Society. Beginning in 1867 with an account of the Grey Phalarope in Great Britain during the autumn of the previous year, he published 'Rambles of a Naturalist in Egypt and other Countries' in 1876, followed by a 'Catalogue of the Birds of Norfolk' in 1884, reprinted from Mason's History of that county; and a 'Catalogue of the Birds of Prey in the Norwich Museum' 1894, a continuation of his father's volume in 1864. In local reports he was indefatigable, more than a hundred contributions to the county avifauna being credited to him. The year 1913 witnessed the production of his volume on 'The Gannet: a bird with a history,' with many illustrations and maps, which must remain a classic.

He was an original member of the Norfolk and Norwich Naturalists' Society, which was founded in 1869, and was its President for four terms, the last being in 1919-20. In 1876 he married Margaret Jane, daughter of Henry Edmund Gurney, a member of another branch of the family; at his death at Keswick Hall, near Norwich, after a short illness, on the 9th November, 1922, he left one son and three daughters. [B. D. J.]

The Right Rev. Dr. SAMUEL TARRATT DE TERROT NEVILL, the first Bishop of Dunedin and Primate of New Zealand from 1904 to 1919, was born at Lenton, near Nottingham, on the 13th of May, 1837, the third son of Jonathan Nevill, lace and hosiery warehouseman, a house which afterwards became J. and R. Morley. The family descended from Hugh de Nevill, named the Lion, a benefactor of Lenton Abbey and owner of the land now forming the site of Nottingham. After leaving school our late Fellow entered his father's business, but feeling drawn to holy orders, entered St. Aidan's College, near Birkenhead, and in 1860, he was offered the curacy of Searisbrick, Lancashire, where he stayed some years, and during that period married Mary Susan Cook Penny, daughter of James Penny, merchant, of Heavitree, near Exeter. One year later he became rector of Shelton, Staffordshire, where he found the church in ruins, and the parish in a most deplorable state of neglect, without schools or organizations of any sort, with the people sunk in moral degradation. During his tenure of the living he effected a remarkable change in the parish; he repaired the church, filled it with a congregation in place of the former half-dozen worshippers, and greatly improved the general state of things. While at Shelton, where he had four curates working under him, he went up to Magdalene College, Cambridge, where he took his B.A. in second class honours in the Natural Science Tripos in 1865, proceeding M.A. in 1868. Upon his election as Bishop of Dunedin he received the honorary degree of D.D. at Cambridge, and in 1906 became an Honorary Fellow of his old college.

He was elected Fellow of the Linnean Society on the 7th December, 1865, having in pursuit of palæontology dug in the coprolite beds of the Lower Greensand near Cambridge, where Saurian remains were plentiful; his other subjects for his degree were:—Physics, Comparative Anatomy, with Mineralogy and Crystallography as branches of Geology. Unfortunately for him, the Geological paper set had next to no questions on Palæontology, resulting in a second class only as stated above.

In 1870 he left Shelton Church in charge of his senior curate, and the Bishop of Lichfield (Selwyn) having granted him a year's leave of absence, Nevill and his wife paid a visit to New Zealand. During this visit the Rev. S. T. Nevill was unanimously elected Bishop of Dunedin, and was consecrated in the province, which was followed by a return to England in 1871, returning to his diocese in 1873, when strenuous labour became the usual occupation.

The constant exertions of the Bishop led to developments in organization, and amongst them to the building of St. Paul's Cathedral, the foundation stone being laid 8th June, 1915, and consecration took place on the 13th February, 1919, and shortly afterwards Bishop Nevill laid down his functions, after 48 years as Bishop, and 15 years as Primate of New Zealand.

After his retirement he spent his time in writing, especially his Diary, published after his death by his nephew, the Rev. Canon E. R. Nevill, M.A., Vicar of the Cathedral at Dunedin, in 1922. He died in the last week of October, 1921, and was buried on the 1st November.

The writer gratefully acknowledges the help in the above account of a singularly able and resourceful ecclesiastic, derived from Canon Nevill previously mentioned. [B. D. J.]

WILLIAM HENRY PEARSON, of Withington, near Manchester, was born in 1850, and was for nearly fifty years a yarn agent on the Manchester Royal Exchange, having the reputation of a sound man of business, but delighting in his hobby of studying Hepaticæ, in which he became an expert of wide fame. Dr. Carrington (1827-93) directed his attention to this group of plants and with him he issued in 1878-90, a set of specimens, and in 1902, his sumptuous work on British Hepaticæ saw the light. Continuing his researches, he extended his observations to exotic species, working up, amongst other collections, those gathered by Miss Eleonora Armitage in the West Indies, and those by Prof. R. H. Compton in 1914 in New Caledonia and the Isle of Pines. The latter was published in our Journal (Botany), vol. xlv. (1922), pp. 13-44, plates 2-4.

He received the Hon M.Sc. from the University of Manchester, for whose department of botany he had strenuously laboured; his election as an Associate of the Linnean Society dated from the 17th of January, 1907; he died on Thursday, 19th of April, 1923, and was buried in the Manchester Southern Cemetery. [B. D. J.]

FREDERIC NEWTON WILLIAMS was born at Brentford, Middlesex, on the 19th March, 1862. After his schooldays he studied medicine at University College and St. Thomas's Hospital, and after qualifying in 1883-1885, he settled in his native town as a medical practitioner. His nearness to Kew induced him to carry on his researches in systematic botany, and the writer's earliest remembrance of our late Fellow, was the sight of him with his head buried in a cabinet at Kew, containing herbarium specimens of *Dianthus*, a genus to which he was always partial. His early studies resulted in his little work 'Enumeratio specierum varietatumque generis *Dianthus*' [Brentæ Vadum, 1885]; followed in 1889 by his 'Notes on the Pinks of Western Europe,' London; and then by his ambitious paper in the Journal of this Society, "A Monograph of the genus *Dianthus*," issued in 1893. Two years later he printed his 'Provisional and tentative List of the Orders and Families of British Flowering Plants,' Brentford; a second edition appearing in 1898. That year he issued "A Revision of the genus *Arenaria*" in our Journal, and with the pecuniary help of the Royal Society, he produced 10 parts of his 'Prodromus Floræ Britannicæ,' Brentford, 1901-12. He then transferred his activities to a Swiss publication, the 'Bulletin de l'Herbier Boissier,'

there publishing "Liste des plantes connues du Siam" (1904-5), and his "Florula Gambica" (1907). These constitute his chief contributions to botany. A frequent attendant at our meetings and a diligent frequenter of our library, the news of his death came with startling suddenness to those who never expected a sudden end to his activities. [B. D. J.]

June 7th, 1923.

Dr. A. B. RENDLE, F.R.S., President,  
in the Chair.

The Minutes of the Anniversary Meeting of the 21th May, 1923, were read and confirmed.

Mr. Norman Douglas Simpson and Prof. Robert Scott Troup, C.I.E., were admitted Fellows.

The President announced that he had appointed Dr. A. SMITH WOODWARD, Prof. E. S. GOODRICH, Mr. H. W. MONCKTON, and Dr. A. W. HILL, Vice-Presidents for the ensuing year.

Certificates in favour of Prof. Nalini Mohan Mukerjee, M.Sc., Basant Lal Gupta, M.Sc., and Lilian Alice Mabel, Lady Richmond-Brown were read for the second time.

Laurence Delaney Cleare, jun., Manaranjam Mitra, M.Sc., and Hans Theodor Güssow were proposed as Fellows.

The first paper was by Mr. H. SANDOX: "Some Protozoa from the Soils and Mosses of Spitsbergen obtained by the Oxford University Expedition." (Communicated by D. Ward Cutler, M.A., F.L.S.)

Sir S. F. Harmer, K.B.E., F.R.S., inquired how the species were demonstrated; Lieut.-Col. J. H. Tull Walsh remarked on the food of the Protozoa, and Dr. G. P. Bidder spoke on the direction of movement of the Flagellates; the author replying to the questions put.

The second paper, by Dr. J. D. F. GILCHRIST on "A form of dimorphism and asexual reproduction in *Ptychodera capensis*," was explained by Sir S. F. Harmer, K.B.E., and Dr. G. P. Bidder added further observations.

Prof. C. E. Moss spoke on the species and forms of *Salicornia* in South Africa, illustrated by a series of dried specimens.

The President commented on the difficulty of studying succulent plants except when preserved in fluid, instancing Masson's spirit specimens of *Mesembryanthemum*, which were in the British Museum (Natural History) from the time of Sir Joseph Banks. Bt.

Mr. JAMES BRITTEN referred to the great amount of work done by Daniel Solander in the Banksian herbarium, but as most of the new names he gave to plants were not accompanied by any published description, they had been superseded by later authors.

Mr. J. BURTT-DAVY then gave his paper on the "Geographical Distribution of some Transvaal Leguminosæ," of which an abstract is given on p. 66.

Prof. MOSS supported the abolition of the Kalahari Region as a botanical province. Mr. H. N. RIDLEY pointed out two sorts of endemics—the first, as in the case of *Didymocarpus*, a genus of sixty species in Malaya, with only one outlying species, each having been evolved in its proper region: and the second, endemics which were simply survivals of a lost flora. Mr. J. Burtt-Davy briefly replied.

Prof. MOSS gave an account of the presence of velaminous roots in terrestrial orchids, especially noticeable in the orchid genus *Eulophia*, abundant at the Cape. Mr. H. N. Ridley and Mr. J. Ramsbottom, Sec.L.S., also spoke on the subject, and Prof. Moss replied.

Mr. J. RAMSBOTTOM exhibited specimens of *Choiromyces meandriformis*, White Truffle, from Chelmsford.

June 21st, 1923.

Dr. A. B. RENDLE, F.R.S., President,  
in the Chair.

The Minutes of the General Meeting of the 7th June, 1923, were read and confirmed.

Mr. Robert Barr was admitted a Fellow.

Certificates in favour of Laurence Delaney Cleare, jun., F.E.S., Manaranjan Mitra, M.Sc. (Panj.), and Hans Theodor Güssow, were read for the second time.

Dr. Arthur Francis George Kerr and Ralph Terence St. John-Brooks, M.D., D.P.H., were proposed as Fellows.

The following were severally elected by ballot as Fellows:—

Miss Margery Knight, M.Sc. (Liverpool.), Prof. Nalini Mohan Mukerjee, M.Sc., Basant Lal Gupta, M.Sc., Miss Joan Beauchamp Procter, F.Z.S., the Rev. William Charles Tippet, William Fawcett, B.Sc. Lond., Charles Carmichael Arthur Monro, B.A. Oxon., Thomas Francis Egan, Lilian Alice Mabel, Lady Richmond-Brown, and Mrs. Nora Lilian Alecock.

Messrs. E. HERON-ALLEN, F.R.S., F.L.S., and A. EARLAND, F.R.M.S., presented a paper entitled "The Foraminifera of Lord Howe Island, South Pacific."

Mr. A. EARLAND contributed a few supplementary remarks on the affinities of the new genera described in the paper and on the problems suggested by the occurrence of so many novel forms in a single locality. Dr. Calman commented on the exceptional beauty of the lantern-slides; Mr. Heron-Allen briefly replied.

Mr. T. A. DYMES spoke upon the "Seeds of the Marsh Orchids," with lantern slides, coloured drawings by Mrs. Godfrey, and living plants. He stated that the Marsh Orchids are classified in two main groups: (1) "Maculatæ"; (2) "Latifoliæ."

The chief forms are:—Maculatæ: (a) *maculata* L. = *Fuchsii* Druce; (b) *ericetorum* Lint. = *præcox* Webst.; (c) *O'Kellyi* Druce; and Latifoliæ: (a) *prætermissa* Druce; (b) *incarnata* L.; (c) *purpurella* Steph. p. & f.

As all of these are described by characters taken from parts other than the seeds, it seemed advisable to examine their ripe seeds also.

The two main groups are easily separable by a single feature of the testal cells:—Maculatæ: testal cells sculptured (*i.e.*, with internal coils of thickening); Latifoliæ: testal cells not sculptured.

Other distinctions lie in the form of the testal cells and the breadth and thickness of their common walls.

Similarly the forms within each group are readily distinguishable by their seeds:—Maculatæ: (a) *maculata* L. = *Fuchsii* Druce, apex of testa curved and pointed, coils loose; (b) *ericetorum* Lint. = *præcox* Webst., kernel about 30 per cent. larger than in either of the other two forms, coils loose, less developed than in (a); (c) *O'Kellyi* Druce, a long, almost straight, narrow seed, with the coils close and pronounced. Latifoliæ: (a) *prætermissa* Druce, a long straight seed, not much dilated above the kernel, which is about the same breadth as the adjacent portion of the testa; (b) *incarnata* L., a much shorter and broader seed than (a), greatly dilated above the kernel which is distinctly narrower than the adjacent portion of the testa, the mesh of the testa smaller than in (a); (c) *purpurella* Steph. p. & f., the smallest of the three, testa dusky, indented on one or both sides above the kernel and tapering to a point, mesh small.



With regard to *Orchis latifolia* L., it is doubtful whether there is in this country anything so-called that is not a hybrid or a mongrel derived from two or more of the six forms already dealt with.

In striking contrast with the other forms, seeds from different or even from the same *O. latifolia* vary greatly in all the points which have been noted.

On the continent there is a form believed also to be British, referable to *Orchis majalis* Reichb., whose seeds appear to be uniform. They combine some of the characters of each group, but this does not necessarily spell hybridity, nor does their appearance suggest it.

It is possible that this form may be a now well-established hybrid-species of one of the Maculatæ with one of the Latifoliæ, or it may be the parent of both these groups.

That question, along with all those connected with the so-called *O. latifolia* L. in this country can, in the opinion of the author, be settled only by careful and extensive experiments in breeding.

Colonel GODFREY gave an account of the occurrence of certain of these forms abroad, especially in the case of those which did not grow associated with allied forms. The exhibitor replied.

Prof. A. DENDY, F.R.S., F.L.S., and Miss LESLIE M. FREDERICK presented a joint paper "On a Collection of Sponges from the Abrolhos Islands, Western Australia," Miss Frederick commenting on the forms by the aid of lantern-slides.

Dr. G. P. BIDDER congratulated Miss Frederick on her joining the somewhat restricted number of students of sponges, and upon the result of the work shown.

Dr. ETHEL N. MILES THOMAS followed with her "Observations on the Seedling Anatomy of the Genus *Ricinus*."

The interest of this communication lies in the discovery of a widespread feature of seedling anatomy, in conjunction with anatomical arrangements very diverse from those with which it is usually associated.

The passage from root to hypocotyl was briefly described in 1900 by Miss Edith Chick for *Ricinus communis* (Proc. Roy. Soc. Edin. xxii. (1900) pp. 117-129). She states that transition takes place entirely in the "root" as defined by the position of the collet, and that above the collet only stem structure is met with.

The present investigation establishes the presence of *alternate* or *root* xylem in the hypocotyl and cotyledons of several species of *Ricinus*, including *R. communis*. Moreover, it demonstrates that at an early stage the alternate or radial elements *alone* are lignified.

In spite of these new facts, however, Miss Chick's account remains substantially true in that the tissue groupings associated with root structure are only found low in the axis, while above the

collet eight stem bundles are to be found which are continued upwards as the four equally spaced bundles of the cotyledons. In addition, however, are to be found alternate xylem elements in the cotyledonary plane, *i. e.*, that passing through the centre of each cotyledon.

The existence, as well as the resorption, of these elements which are usually in direct continuity with the cotyledonary root poles, has now been established in a large number of dicotyledonary species, and was observed by Chauveaud so early as 1901, and by the writer independently in 1902. The extent of development and the amount of resorption varies with age, region, and species. In *Ricinus* very few elements are formed and much resorption occurs, so that their observation is difficult. The rapid elongation of the hypocotyl no doubt accounts for their frequent absence in the basal region of the hypocotyl.

The discovery of alternate xylem elements between the central bundles of the cotyledon of *Ricinus* proves the homology of these with the double bundle of *Mercurialis* and other forms as suggested by the writer in 1907 ("A Theory of the Double Leaf-trace founded on Seedling Structure"—*New Phytologist*, vi. (1907) pp. 77-91). It also negatives the view that the presence of alternate or centripetal xylem in the cotyledons is necessarily associated with "high" transition.

A long series of lantern-slides were shown in exemplification of the details described.

Dr. D. H. SCOTT, F.R.S., spoke, explaining that an error in his description of the early anatomy of the wallflower, *Cheiranthus Chiri*, was due to the fact that the observations were founded upon material which had lost the structure now pointed out by Dr. Thomas.

The last paper was read in title: it was by Dr. C. H. O'DONOGHUE on Opisthobranchiata collected in the Abrolhos Islands, and was communicated by Professor W. J. DAKIN, F.L.S.

Two exhibitions followed, the first of some abnormal specimens of *Ranunculus acris* with small flowers and aborted stamens, sent by Mr. JOHN PARKIN from Cumberland, where they have been abundant this year. The second, by the President, of Fasciations of a *Crepis*, Ox-eye Daisy, and two states of the Foxglove, one having a terminal regular flower.

## ABSTRACTS.

The Strobilus Theory of Angiospermous Descent.

By JOHN PARKIN, M.A., F.L.S.

[Read 15th March, 1923.]

THE author sees at present no sufficient reasons for abandoning or seriously modifying the theory of the origin of Angiosperms (Flowering Plants) brought before the Society in 1907 by the late Dr. Newell Arber and himself (5).

After this lapse of time it may not be without interest and one trusts profitable to re-state shortly the theory, to further elaborate it, and to review it in the light of work since accomplished bearing on it.

*Re-statement.* In the first place the theory is based on the idea that the Angiosperms constitute a monophyletic group. In the second place the cohort, Ranales, is held to contain families with the least modified flowers. In a general way, from such a type of flower as is, for example, possessed by some of the Magnoliaceæ all other flowers are considered to be derivable by reduction and modification. A hermaphrodite flower, in short, with its members indefinite in number, free from one another, borne spirally on a long axis and arranged in a definite sequence on this axis, viz., proceeding from below upwards first perianth members with no clear separation into sepals and petals, then stamens, and finally carpels. We may speak of such a derivation of all Angiospermous flowers as the *Ranalian hypothesis*—a hypothesis in the writer's opinion almost amounting to a generalisation.

A flower such as the above is to all intents and purposes a strobilus, but a strobilus of a special type to which we gave the name of *anthostrobilus* on account of its being characteristic of flowering plants. Such a strobilus is distinguished not only by being bisexual, but also by having its microsporophylls (stamens) invariably placed on the axis below (morphologically speaking) the megasporophylls (carpels), and further by having the whole of these fertile organs subtended by a number of sterile members constituting the perianth.

With the exception of the Angiosperms the only known plants which obviously possessed such a type of strobilus were the extinct Bennettitales. We therefore definitely put forward the view—Wieland and others had hinted at it—that of all known fossil plants this group was the most closely related to the Angiosperms. The peculiar and very reduced nature of the female part of the Bennettitean cone debarred tracing any *direct*

connection between it and the Angiosperms gynæcium, so we postulated a hypothetical group, the Hemiangiosperms, as the direct ancestors, characterised by having open instead of closed carpels with the ovules marginally borne. We introduced the prefixes *pro* and *eu* to distinguish respectively the anthostrobilus with open carpels and that with closed carpels. The Angiosperms, then, as a whole, possess eu-anthostrobili and the Hemiangiosperms pro-anthostrobili.

In a second joint paper (6) reasons were brought forward for regarding the individual "flowers" of the Gnetales as very reduced pro-anthostrobili, and we theorised to the effect that the existing members of this puzzling group might be held to be very aberrant survivors of the Hemiangiosperms.

It is important to distinguish clearly between the two sides of the Strobilus Theory, viz.: what may be termed respectively the Bennettitalean and Ranalian sides. The Ranalian hypothesis can stand alone, even if the supposed Bennettitalean relationship were disproved. Some botanists apparently have failed to grasp this. To clinch my point I had myself discarded Engler's theory and embraced a Ranalian origin of Angiosperms some time before I was aware of the existence of the Bennettitalean fructification.

Possibly some botanists have been converted to the idea of a Ranalian derivation of Angiosperms by seeing in this view a plausible origin of Flowering Plants from ancestors akin to the Bennettitales. Realising the possibilities of the strobilus theory of the flower, they are not likely to return to the idea of the primitiveness of one consisting only of a single stamen or carpel, even if the supposed Bennettitalean relationship may have to be relinquished.

*The Bennettitalean side.* The crux of the strobilus theory as regards its Bennettitalean side centres round the anthostrobilus, that is to say, the sequence in which the sporophylls are borne on the axis of the cone. Invariably both in Angiosperms and Bennettitales the megasporophylls are borne on the axis above the microsporophylls. With the exception of the Gnetales (*Welwitschia*)—a case of especial significance—no other group of plants, fossil or recent, is known characterised by such a strobilus. All other Gymnosperms when cones are present have these unisexual. In *heterosporous* forms of the *Lycopside*, however, bisexual cones appear to be the rule; but here we find that the relative position of the two kinds of sporophylls on the axis is the reverse of that in the anthostrobilus—the basal part of the cone being female and the upper male, e. g., *Calanostachys*, *Lepidostrobilus*, *Selaginella*.

From the foregoing it becomes manifest that the type of cone possessed by the Bennettitales, and named by us the anthostrobilus, is at present unique among fossil plants. On the assumption that the Bennettitales have descended from Pteridospermous stock the question arises:—Has the anthostrobilus arisen from this plexus at more points than one? It may have, but in the existing state of our knowledge it is permissible to imagine that

it has evolved only once, and from it on the one hand diverged the Bennettitales and on the other the direct ancestors of the Angiosperms.

Let me now consider shortly the manner in which cones may have arisen from the loosely-arranged sporophylls met with in the Pteridosperms. Without speculating as to how originally the two kinds of sporangia were borne relative to one another on the Pteridospermous frond, it is safe to assume that eventually two kinds of spore-bearing fronds were evolved, viz., the mega- and microsporophyll. The massing together of such sporophylls into cones (strobili) can be conceived of as taking place in two ways. Either both kinds of sporophylls were aggregated into one and the same cone, producing the bisexual condition; or each kind was segregated apart, forming distinct male and female strobili. The Bennettitales evidently took the former course, and the Cycadales probably the latter. The arrangement of the mega-sporophylls in *Cycas* is difficult to reconcile with the view that the dichinism of the Cycads arose from an earlier hermaphrodite state through reduction.

Adopting the view of a Pteridospermous origin of all Gymnosperms, one may hazard the opinion that the ancestors of the Conifers were evolved from the Pteridosperms at a very early period by segregating their sporophylls into unisexual strobili. On this supposition the unisexual nature of their cone has not been due to reduction from a previous bisexual condition. There is no evidence to show that any of the Coniferales, including their forerunners, the Cordaitales, were ever other than unisexual. The Ginkgoales were probably another evolution from the same plexus which commenced on unisexual lines. Consequently, of all known Gymnosperms, extinct and extant, the Bennettitales and the Gnetales would appear to be the only groups to have possessed primitively bisexual cones.

In our joint paper we advanced the view that the rise of the Angiospermous type of anthostrobilus—the one with the closed carpel—was bound up with the substitution of entomophily for anemophily (5. p. 73). The writer is now inclined to extend this idea and to suggest that the anthostrobilus may have owed its origin to insect-visitation. Adopting the view that cross-fertilisation is of paramount importance in evolution, it follows that in the case of wind-pollinated plants it is an advantage in their passage to the strobilate condition to segregate the two kinds of sporophylls. The chances for cross-pollination will thereby be increased. Possibly this may have been the general trend in cone-formation among seed-plants in Palaeozoic times before pollen-seeking insects appeared. Such a nutritive pabulum as pollen, one can imagine, would early attract primitive insects. In seeking it from the primitively unisexual Gymnosperms no advantage in the way of cross-fertilisation would accrue, as the female cones would not be visited. The Pteridosperms would on this supposition also be visited for pollen. They would potentially be

able to evolve in a direction capable of using insect-agency for the purpose of cross-pollination. This could be and may have been brought about by the aggregation of both kinds of sporophylls into one and the same cone.

It is not difficult to advance a reason why the anthostrobilus—the supposed insect-pollinated strobilus—has invariably the male sporophylls situated on the axis below the female. By this arrangement there would be less likelihood of self-pollination. In the reverse sequence pollen would be apt to fall on the ovules below. Further, it may be conjectured that a pollen-seeking insect would alight on the apex of the cone and, in the event of the microsporophylls being on the upper part of the strobilus, the megasporophylls below would not be traversed and no cross-pollination would ensue.

As regards the evolution of the anthostrobilus from the Pteridospermous arrangement of sporophylls, probably on a given axis a series of one kind of sporophyll (preferably male) was followed by a series of the other kind. A primitive anthostrobilus would result from such an axis ceasing further growth apically. Each batch of sporophylls may be imagined to have been protected by a series of bracts. The lower series became the perianth of the anthostrobilus. The upper series aborted as the two sets of sporophylls drew closer together on the axis, allowing the lower series to take on the protective function of both. The length of bare axis which separated the male and female parts of the cone in some Bennettiales may signify that the two kinds of sporophylls were originally some distance apart. It is tempting in this connection to see some ancestral significance in the gynophore of *Michelia*, a genus separated from *Magnolia* on account of possessing this feature.

At the time of the publication of our paper perhaps the weakest point in our theory lay in the lack of any similarity between the vegetative features of *Bennettites* and the Dicotyledonous tree. The former was so Cycadean in leaf and stem as to bear no resemblance to the latter, and had besides apparently axillary fructifications. We postulated a solitary flower as a primitive Angiospermous character, and the writer has shown since (38) that this was probably borne terminally to a leafy shoot. Now a striking feature brought to the front in recent years respecting Bennettitalean genera other than *Bennettites* (Cycadeoidea) itself resides in the fact that the strobili were borne terminally. Such cones occurred in *Williamsonia*, *Wielandella*, and *Williamsoniella*. Further, the vegetative features of the above three genera had other points in common with the Dicotyledonous tree. The following may be mentioned:—(1) Marked internodes; (2) slender stems; (3) free branching; and (4) small foliage leaves. The evolution of the Dicotyledonous tree-habit from that of the Pteridosperm is thus rendered less improbable. The Bennettiales went part of the way only, the Hemiangiosperms on parallel lines the full way.

When our theory was promulgated it no doubt appeared a big step to assume that the Angiospermous stamen was derived by means of extreme reduction from a pinnate frond-like microsporophyll, such as occurred in *Bennettites*. Now we know that in the Bennettitalean line great reduction has apparently taken place in this member. Attention is directed especially to the microsporophyll of *Williamsoniella cruenta*, which may carry only two pairs of synangia (53, p. 119). Using this as a parallelism, it is not an improbable assumption that the reduction has been carried a stage or two further in the Angiospermous line, resulting in the stereotyped stamen with its pair of bilocular synangia.

In our paper attention was drawn to the importance of the fact that in the Magnoliaceae the connective is prolonged beyond the anther as a sterile tip (5, p. 48). This vestige, as we believed it to be, suggests comparison with the sterile pointed extremity of the Bennettitean microsporophyll. At any rate this protrusion of the connective beyond the anther may point to the fact that in the Angiospermous line of descent the anther had not originally an apical position, but that in the course of evolution it has been left so through the sterile terminal portion of the stamen aborting.

The additional knowledge acquired in recent years ament the Bennettitalean fructifications has not enlightened us in the least as to the true nature of the female part of the cone. This structure is built up essentially the same in all forms. The simplest view to take is to regard the interseminal scale and seed-pediceal as homologous, and this is the one the writer at present is inclined to favour (45, & 53, p. 139). It is a "far cry" from the seed-bearing frond of the Pteridosperm to the seed-pediceal of *Bennettites*; but keeping in mind the great reduction which has apparently taken place in the corresponding male frond, it is not impossible that this pediceal may represent the female frond reduced to its lowest term, viz., to a single stalked ovule.

*Gnetales*. One of the merits of the strobilus theory is apparent in the fact that it finds provisionally a resting-place for this puzzling group. We regarded them as a much modified remnant of an assemblage of plants which left the main stem before this had reached the Angiospermous level. A number of papers dealing with the Gnetales have appeared since, notably from the pen of the late Prof. Pearson. After a careful perusal of these I fail to find any new facts which render our standpoint untenable. Recent work tends rather to accentuate their relationship to the Bennettitales, and to bring them nearer to this fossil group than we were inclined to do (cf. 11, 43, 52).

The male flower—morphologically hermaphrodite—of *Welwitschia* seriously interferes with the endeavour to derive the Gnetales directly from the Conifers. Thompson (55) tries this once more, but finds this flower inconveniently in the way. Likewise attempts to connect the Gnetales with the Amentales through floral structure or with the Piperales through supposed

gametophytic similarities fail to be convincing. Here, I think, we merely have superficial resemblances of no phyletic significance.

Both Pearson (39, pp. 334 & 340) and Thompson (55, p. 150) are inclined to regard the terminal (cauline) ovule as primitive and raise anew what we had hoped was an out-of-date controversy. On the strobilus theory the cauline ovule presents no puzzle. Primitively from Pteridosperms onwards the ovule was leaf-borne. In the case of a pro-anthostrobilus in which both carpels and ovules have been reduced to unity and the carpellary-leaf to vanishing point, then through stress of circumstances the solitary ovule becomes pressed into the terminal position and may for descriptive purposes be termed cauline. It occupies the place of a terminal bud, but it cannot be considered as such, nor can it be regarded phyletically as of cauline origin. Such reasoning applies to the solitary terminal ovule of the Gnetales. In the Angiospermous flower a terminal cauline ovule can result from a syncarpous gynœcium becoming reduced to a single ovule, but in this case naturally some carpellary structure remains to enclose the developing seed.

*The Angiosperms a monophyletic group.* The writer is under the impression that at the present time the majority of botanists regard the Angiosperms as a natural, that is to say a monophyletic, group. This view has only become prevalent in recent years. As late as 1911 Prof. Weiss favoured a polyphyletic origin (57, p. 556).

Notwithstanding the wide differences in floral structure the two following striking features render to my mind the monophyletic standpoint well-nigh unassailable:—

- (1) The stereotyped nature of the embryo-sac.
- (2) The same type of microsporophyll throughout the group.

Even admitting the possibility of the Angiospermous embryo-sac as having arisen independently more than once, the chance of its being associated each time with the same kind of microsporophyll would be extremely unlikely.

The monophyletic view could be based on other grounds, such as vascular anatomy. Respecting those touching the flower, the acceptance of the Ranalian hypothesis would be involved. Let the monophyletic origin be conceded, then the only rational way of explaining the evolution of the flower is by this hypothesis.

*Amentifera.* Those botanists who reject the application of the reduction theory to the flower of the Amentiferae appear to be on the horns of a dilemma. They must either accept a polyphyletic (or at least a diphyletic) origin for Angiosperms, or else must show how to derive the bisexual from the unisexual flower.

What evidence is there for the view that the hermaphrodite flower has evolved from the unisexual one? Professor Weiss rejects the application of the reduction idea to the Amentales on account of this group possessing "certain characters which appear to me to be undoubtedly primitive" (57, p. 556). The



characters he mentions either had then or have since been shown to be not peculiar to the Amentales; but the point I wish here especially to criticise concerns the origin of the hermaphrodite flower. Evidently he is of the opinion that in the phylogenetic sense a unisexual strobilus can revert to the bisexual state, and he cites in his support the occurrence of androgynous cones in the Coniferae. These in my estimation have merely a teratological significance. This may seem to be begging the question, so I state my argument as follows. Until a new species of (say) *Pinus* be discovered, which normally bears androgynous cones and which is except for this peculiarity a true pine, I decline to attach any phylogenetic importance to these freakish cones. Evidence has yet to be produced to show that a species with hermaphrodite cones or flowers has ever arisen from one bearing unisexual fructifications. For the converse, the evidence is overwhelming.

Viewed in the light of our theory the origin of the hermaphrodite flower or cone presents no difficulty. The two kinds of sporophylls are regarded as caught up together into one and the same strobilus from the lax Pteridospermous arrangement. The unisexual condition has resulted from the abortion of one kind of sporophyll in the strobilus. The Englerian can, of course, maintain that the Amentiferae have been unisexual from the beginning; but then he must confess to at least a diphyletic origin for Angiosperms, and must refrain from formulating any direct relationship between the catkin-families and hermaphrodite flowering plants. But this he declines to do. Engler's system, in fact, is based on a kind of general and hazy idea that naked unisexual flowers of few parts are primitive, and that from these have gradually emerged by a series of steps the fully-equipped hermaphrodite flower with both calyx and corolla. No attempt is made to trace by means of examples how this evolution has come about.

Let us briefly glance at the families which may now be considered to compose the Amentiferae. The Salicales can no longer be included. The group then is narrowed down to the Englerian cohorts, Juglandales, and Fagales, with the addition of *Casuarina*. There is a general consensus of opinion that *Casuarina* is fairly closely related to the Betulaceae (12, 25). There are also reasons for regarding the Juglandales as having affinities with the Fagales. Hemsley's new family, the Julianiaceae (23), was looked upon for a time as a link between the Juglandaceae and the Anacardiaceae; but probably the Julianiaceae should more correctly be considered as merely reduced Anacardiaceous forms with no real relationship to the Juglandales (19). A Rosalian origin for the Amentiferae as a whole would appear to be the more plausible view. There may be some element of truth in Hallier's original suggestion of deriving the catkin-families from the Trochodendraceae through the Hamamelidaceae.

In recent years perhaps most stress has been laid on the structure of the wood as pointing to the primitiveness of the

Amentiferæ. Prof. Jeffrey (28, p. 384) makes much capital of this in opposing the Ranaïian standpoint. The two characters of the wood chiefly concerned bear on the nature of the perforations of the vessels and on the composition of the medullary rays. He is careful to dwell on the fact that scalariform perforations characterise the wood of *Cusuarina* and the Fagales; but refrains from laying stress also on their abundance in the arborescent Ranales! Bailey and Sinnott (7) have advanced serious objections to Jeffrey's aggregate ray theory, upon which the supposed primitiveness of the medullary ray in the Amentiferæ rests.

The view that of all Dicotyledons certain of the Amentiferæ have the least evolved type of wood is weakened by the fact that some of the Ranales, viz., *Drimys*, *Zygogynum*, *Trochodendron*, and *Tetracentron*, are lacking in true vessels. Jeffrey dismisses the matter in rather an arbitrary fashion by imagining that the vessels have disappeared (28). These forms are woody plants, and if vessels had once been present one wonders what can have led to their suppression.

*Monocotyledons.* It is now the prevailing opinion that Monocotyledons have descended from Dicotyledons, that is to say that their ancestors had two cotyledons. Except the cotyledonary distinction there is no fundamental feature of difference between the two groups. Some years ago the absence of cambium in Monocotyledons might have been held as fundamental, but in the light of recent work (2) this deficiency has no or slight phyletic value. The geophytic or aquatic origin of Monocotyledons explains the loss of this cambium, and the arborescent types, such as palms, can be regarded in the light of new evolutions, in which the tree-habit has been regained by the adoption of fresh means of attaining stem-rigidity. This habit, broadly viewed, is primitive to the herbaceous in Dicotyledons, but the reverse may be considered to hold in the case of the Monocotyledons.

It must be conceded on geological evidence that the Monocotyledons are an old assemblage of flowering plants, and they must perforce have left the Dicotyledonous line of descent at an early period. The question naturally arises, are they mono- or polyphyletic respecting their derivation from Dicotyledons? Though no satisfying answer can yet be given to this question, the writer sees no cogent reason for regarding the group as other than monophyletic and of possible Ranaïian extraction. The floral features in common between the Helobieæ on the one hand and the Ranales (especially certain of the Nymphæaceæ) on the other hand suggest something deeper than mere parallelism. The supposed connection between the Piperaceæ and the Araceæ, based originally by Campbell on gametophytic resemblances and later by A. W. Hill on the presence of heterocotily in *Peperomia*, does not appeal to the writer, because in both cases it is forcing an affinity between highly evolved rather than between primitive members of these families.

The problem of the true nature of the single cotyledon of Monocotyledons is still unsolved, but Coulter and Land's contribution to the question (17) may go some way towards the solution. They conclude from a study of *Agapanthus* that cotyledons are always lateral structures and that the single one is due to the growth being concentrated into one rather than two primordia.

Respecting the relative merits of an aquatic or geophilous ancestry for Monocotyledons, the two views may be somewhat reconciled by regarding the earliest ones as neither markedly aquatic or extremely geophilous—in fact, marsh plants with stout rhizomes. Some of their descendants have become completely hydrophytic, others sharply geophytic, while others again have retaken to the arborescent habit by fresh means.

*Ovule.* The absence of the orthotropous ovule in the Ranales might be advanced as an objection to our theory, especially as it occurs in families considered primitive by the Englemans. This, of course, is on the assumption that orthotropy is primitive for Angiosperms. There is now reason to doubt this. It has been shown for example in the case of *Juglans* (10, p. 628) and *Ulmus* (9) that their ovules commence their development as anatropous ones and gradually assume the orthotropous form. Other cases of orthotropy among Angiosperms deserve investigation from this point of view.

*Embryo-sac.* On account of the meagre variation in the embryo-sac of flowering plants, little, if any, use can be made of it in determining relationships within the group. That of *Peperomia* was taken for a time as showing primitiveness, but this can hardly any longer be maintained. The writer is inclined to regard the 8-nucleate sac as primitive for Angiosperms and any departures therefrom as derived (47, p. 385). There is little hope of finding among existing flowering plants a sac less reduced.

Since *Welwitschia* and *Gnetum* are the only Gymnosperms which do not form definite archegonia in their embryo-sacs, it is tempting to compare their sacs with that of the Angiosperm. That they form an interesting parallelism to that of the flowering plant and are suggestive of the way the latter has evolved from the Gymnospermous sac may be conceded; but that these Gnetalean embryo-sacs are phyletically connected with that of the Angiosperm is to me improbable. Pearson (39, p. 378) attempted to connect them so, using that of *Peperomia* as a link. As already mentioned this sac can no longer be upheld as primitive. Besides there are grave difficulties in the way of connecting phyletically the Gnetales with the Piperales by using the highly evolved genus, *Peperomia*, as an intermediary.

*Engler's System.* Engler's system, an elaboration of that of Eichler's, which ousted largely but not wholly Bentham and Hooker's founded on that of the French school of taxonomy, has had a considerable reign, and it is high time for the sake of progress in the study of the flower that it should no longer be blindly followed, but critically examined with the view of the adoption of

a new system of classification embracing the best features of both schools. There is no gainsaying the fact that Bentham and Hooker's system, which was modelled on that of De Candolle, is out of date, but two or three of its main features may justify maintenance. These are:—(1) The retention of the Ranalian families at the commencement of the Angiosperms; (2) the placing of the Dicotyledons as a whole in front of the Monocotyledons; and perhaps (3) the retention of the time-honoured triple division of the Dicotyledons founded on the corolla. In the Ranales we not only have a preponderance of primitive floral features from the standpoint of the strobilus theory, but also indications of most of the main modifications of the flower, which became characteristic for other groups. As the Monocotyledons are now generally considered to have sprung from Dicotyledonous ancestors, they should certainly follow, and not precede, as Engler has them, the Dicotyledons. The series, Polypetalæ, Sympetalæ, and Apetalæ or their equivalents, may not as yet have outlived their usefulness as convenient sub-divisions of the Dicotyledons, provided we guard against attributing to them any monophyletic signification. The Polypetalæ may be viewed as polyphyletic from the Ranales or Pro-Ranales if preferred, and the Sympetalæ are doubtless so from the Polypetalæ. The retention of the Apetalæ would only be justifiable on the grounds of our inability to connect such forms with Polypetalous cohorts. Instead of forcing relationships it might be convenient as a temporary measure to keep a third series for such families, whether it be called Apetalæ, Incompletæ, Monochlamydeæ, or by some other less committal name.

De Candolle was the first to commence a linear sequence with Ranalian families, and Bentham and Hooker followed suit. These systematists failed, however, to perceive in this any phylogenetic significance\*. Systematic botany was, and still is to some extent dominated by the idea of the 5-whorled pentamerous flower constituting the ground-plan of the majority of Dicotyledonous flowers; and the principles of doubling, splitting, and branching have been too freely invoked to account for members in the whorls greater than five. By adopting the Ranalian theory there is no need to press the matter in this fashion. Unless the balance of evidence is strongly on the other side, it is more natural to assume a sign of primitiveness in many membered whorls. Let it be clearly understood that there is no desire to infer that there have been no cases of increase in floral members by splitting and the like. I withhold judgment, only emphasising the necessity of re-studying all such apparent instances by the help of the strobilus theory. Many obscure points in floral structure, in my opinion

\* See in this connection a letter dated May 13th, 1907, from Sir J. D. Hooker to Dr. Newell Arber, reproduced in 'Life and Letters of Sir J. D. Hooker' by Leonard Huxley, London, 1918, vol. ii. p. 22.

will vanish. The Ranalian families to the older systematists were somewhat of a stumbling block, as their flowers were difficult to harmonise with the formal flower of alternating whorls. To those who embrace the anthostrobilate theory of the flower, these families instead of mystifying supply the key to the whole. Indefiniteness in all parts of the flower is what we are on the watch for and requires no explaining away.

Engler's system really owed its origin to a praiseworthy effort initiated by Brongniart to abolish the Apetalæ. The latter recognised that most apetalous flowers were reductions from polypetalous types, and should therefore be capable of being intercalated among the Polypetalæ. Instead of keeping strictly to this progressive idea and at the same time retaining the Ranales at the commencement of the sequence, Engler and his school diverged on novel lines, postulating the primitiveness of the unisexual flower without, or with merely a sepaloid, perianth. He passes from such forms to families possessing a uniseriate petaloid perianth, and then to ones with a definite calyx and corolla. Superficially the system appears so far to run smoothly; but now comes the weak link in the chain—the Ranalian families have to be inserted. They break the progressive nature of the sequence with their indefinite perianth. Without them the gradual perfecting of the biseriate perianth would have followed through the polypetalous families up to the Sympetalæ. The Ranales stand inconveniently in the way, just as they did with the old formalists. A linear arrangement of families is, of course, merely a makeshift, but at the same time an unavoidable one. As far as possible it should follow evolutionary lines, and after that its practical value should be consulted. Engler's system in the writer's opinion fails to fulfil the first condition, and granting this there is no reason in retaining it on the second account, for it is no improvement on Bentham and Hooker's arrangement from the practical point of view. It is a matter of regret that certain recent English systematic publications have been arranged on Englerian lines, thus departing from the long continued practice of commencing British floras with the Ranunculaceæ.

It is interesting to note in the history of taxonomy that each big forward move has usually been accompanied by a step backwards. Engler's system will prove no exception. The forward move consists in a better grouping of the families into cohorts (orders), and the backward step in allowing the catkin-families to usurp the place previously occupied by the Ranales.

The German school of taxonomy, associated with Treub's classical work on *Cusuarina*, has had, however, this merit. Attention became focussed on the Amentiferous families with the hope of establishing their primitiveness, of elucidating the nature of the Angiospermous embryo-sac and of connecting them phyletically with the Gnetales, thus affording a real clue as to the origin of flowering plants. None of these expectations have been

realised. Surely as the key to the origin of the flower appears not to lie in this direction, it is time the attack was turned elsewhere, viz., to the Ranalian families and especially to the arborescent ones.

As a stimulus to research Engler's system may then be said to have outlived its usefulness and to have now a stultifying influence on the study of the flower (20). The strobilus theory, on the other hand, provides a perfectly intelligible working hypothesis with which to approach this study. It has never yet been put sufficiently to the test to see how far it will carry us, though it is evident that a commencement has now been made in this direction (27).

In conclusion, I take this opportunity of expressing my thanks to Dr. D. H. Scott, F.R.S., for much helpful criticism and for many kindly suggestions, especially in respect to the palaeobotanical side of this paper.

#### BIBLIOGRAPHY.

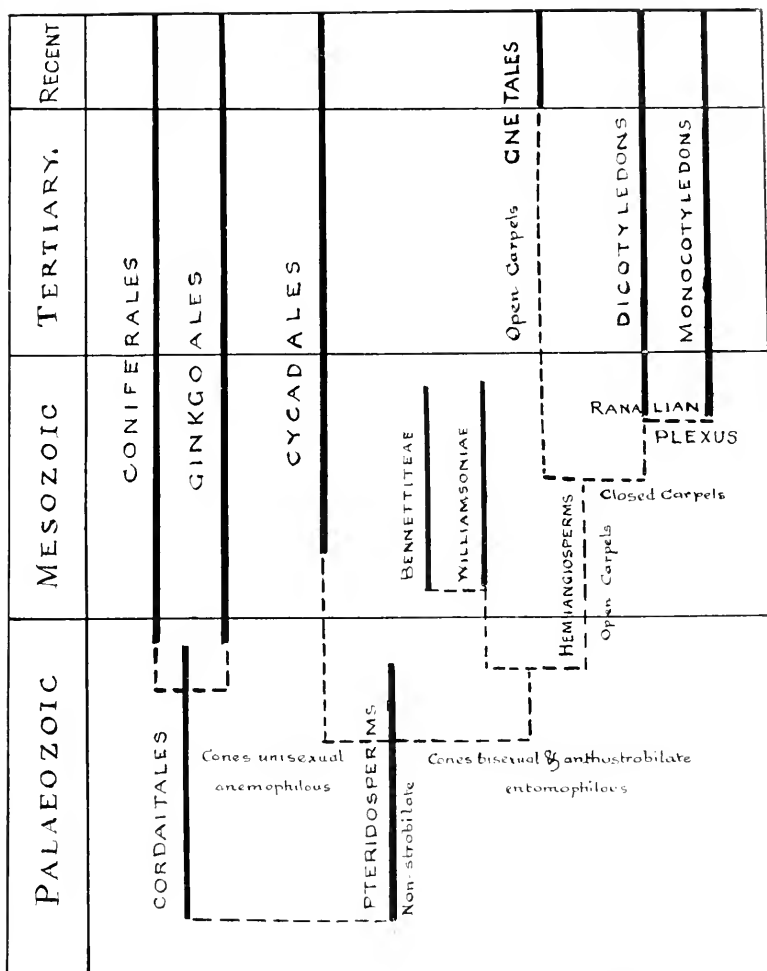
(From 1907 onwards.)

1. ARBER, A. (1918).—The Phyllode Theory of the Monocotyledonous Leaf, with Special Reference to Anatomical Evidence. *Ann. Bot.* xxxii. pp. 465-501; also to a series of papers since supporting the phyllode theory.
2. ARBER, A. (1919).—Studies on Intrafascicular Cambium in Monocotyledons. *Ann. Bot.* xxxiii. pp. 159-465, and (1922) *Ann. Bot.* xxxvi. pp. 251-236.
3. ARBER, A. (1920).—Water Plants, Cambridge, pp. i-xvi and 1-436.
4. ARBER, the late E. A. N. (1919).—Remarks on the Organization of the Cones of *Williamsonia gigas* (L. & H.). *Ann. Bot.* xxxiii. pp. 173-179.
5. ARBER, E. A. N., and J. PARKIN. (1907).—On the Origin of Angiosperms. *Journ. Linn. Soc., Bot.* xxxviii. pp. 29-80. Translated into German in *Oesterreich. Bot. Zeitschrift*, lviii. pp. 89, 133, 184 (1908).
6. ARBER, E. A. N., and J. PARKIN. (1908).—The Relationship of the Angiosperms to the Gnetales. *Ann. Bot.* xxii. pp. 489-515.
7. BAILEY, I. W., and E. W. SINNOTT. (1914).—Investigations on the Phylogeny of the Angiosperms, No. 2. Anatomical Evidence of Reduction in certain Amentifera. *Bot. Gaz.*, lviii. pp. 36-58.
8. BAILEY, I. W., and W. P. THOMPSON. (1918).—Additional Notes upon the Angiosperms, *Tetracentron*, *Trochodendron*, and *Drimys*, in which Vessels are absent from the Wood. *Ann. Bot.* xxxii. pp. 503-512.
9. BECHTEL, A. R. (1921).—The Floral Anatomy of the Urticales. *Amer. Journ. Bot.* viii. pp. 386-410.
10. BENSON, M., and E. J. WELSFORD. (1909).—The Morphology of the Ovule and Female Flower of *Juglans regia* and of a few allied genera. *Ann. Bot.* xxiii. pp. 623-633.
11. BERRIDGE, E. M. (1911).—On some points of resemblance between Gnetalean and Bennettitean seeds. *New Phytologist*, x. pp. 140-144.
12. BERRIDGE, E. M. (1914).—The Structure of the Flower of Fagaceæ, and its bearing on the affinities of the Group. *Ann. Bot.* xxviii. pp. 509-526.

13. BESSEY, C. E. (1915).—The Phylogeny and Taxonomy of Angiosperms. *Ann. Missouri Bot. Gard.* ii. pp. 109–161.
14. BLISS, M. C. (1921).—The Vessel in Seed Plants. *Bot. Gaz.* lxxi. pp. 314–326.
15. BOWER, F. O. (1914).—The Presidential Address (Section K) British Association, Australia Meeting, Annual Report, see p. 569.
16. CHURCH, A. H. (1914).—On the Floral Mechanism of *Welwitschia mirabilis* (Hooker). *Phil. Trans. B.* ccv. pp. 115–151.
17. COULTER, J. M., and W. J. G. LANG. (1914).—The Origin of Monocotyledony. *Bot. Gaz.* lvii. pp. 509–519.
18. DE FRAINE, E. (1910).—The Seedling Structure of certain Cactaceæ. *Ann. Bot.* xxiv. pp. 125–175.
19. FRITSCH, F. E. (1908).—The Anatomy of the Julianiaceæ considered from the Systematic Point of View. *Trans. Linn. Soc., Bot.* vii. pp. 129–151.
20. GIBSON, R. J. H. (1919).—Outlines of the History of Botany, London, see p. 258.
21. HALLIER, H. (1908).—Ueber *Juliania* u. d. wahren Stammeltern d. Kätzchenblätter. *Dresden*, pp. 1–210.
22. HALLIER, H. (1912).—L'origine et le système phylétique des Angiospermes exposés à l'aide de leur arbre généalogique. *Archives Néerland. Sér. III. B (Sci. Nat.)*, T. i. pp. 146–234.
23. HEMSLEY, W. B. (1907).—On the Julianiaceæ: A new Natural Order of Plants. *Phil. Trans. B.* excix. pp. 169–197.
24. HENSLOW, G. (1911).—The Origin of Monocotyledons from Dicotyledons, through Self-Adaptation to a Moist or Aquatic Habit. *Ann. Bot.* xxv. pp. 717–744.
25. HOAR, C. S. (1916).—The Anatomy and Phylogenetic Position of the Betulaceæ. *Amer. Journ. Bot.* iii. pp. 415–534.
26. HORNE, A. S. (1914).—A Contribution to the Study of the Evolution of the Flower, with special reference to the Hamamelidaceæ, Caprifoliaceæ and Cornaceæ. *Trans. Linn. Soc., Bot.* viii. pp. 239–309.
27. HUTCHINSON, J. (1923).—Contributions towards a Phylogenetic Classification of Flowering Plants, I. *Kew Bulletin*, no. 2, pp. 65–89.
28. JEFFREY, E. C. (1917).—The Anatomy of Woody Plants, Chicago.
29. KIRSHAW, E. M. (1909).—Note on the Relationship of the Julianiaceæ. *Ann. Bot.* xxiii. pp. 336–337.
30. KIRSHAW, E. M. (1909).—The Structure and Development of the Ovule of *Myrica Gale.* *Ann. Bot.* xxiii. pp. 353–362.
31. KIRSHAW, E. M. (1909).—Further Observations on the Structure of the Ovules of Myricaceæ and allied groups. *Ann. Bot.* xxiii. p. 692.
32. LEE, E. (1912).—Observations on the Seedling Anatomy of certain Sympetala. *Ann. Bot.* xxvi. pp. 727–746.
33. LIGNIER, O., et A. TISON. (1912).—Les Gnétales: leurs Fleurs et leur Position Systématique. *Ann. d. Sci. Nat., Bot.* (9) xvi. pp. 55–185.
34. LIGNIER, O., et A. TISON. (1913).—L'ovule tritégmenté de *Gnetum* est probablement an axe d'inflorescence. *Bull. Soc. Bot. Fr.* x. pp. 64–72.
35. MACDUFFIE, R. C. (1921).—Vessels of the Gnetalean type in Angiosperms. *Bot. Gaz.* lxxi. pp. 438–445.
36. MANEVAL, W. E. (1914).—The Development of *Magnolia* and *Liriodendron*, including a discussion of the primitiveness of the Magnoliaceæ. *Bot. Gaz.* lvii. pp. 1–31.
37. M[OSS], C. E. (1912).—Modern Systems of Classifications of the Angiosperms. *New Phytologist*, xi. pp. 206–213.
38. PARKIN, J. (1914).—The Evolution of the Inflorescence. *Journ. Linn. Soc., Bot.* xlii. pp. 511–563.
39. PEARSON, H. H. W. (1909).—Further observations on *Welwitschia*. *Phil. Trans. B.* cc. pp. 331–402.
40. PEARSON, H. H. W. (1915).—Notes on the Morphology of certain Structures concerned in Reproduction in the genus *Gnetum*. *Trans. Linn. Soc., Bot.* viii. pp. 311–332.







The above table reproduces in graphic form the views expressed in the foregoing paper. The unbroken vertical lines represent approximately the geological records of the plant-groups in question, and the broken lines the suggested phylogenetic connections between these groups. The distance apart of the vertical lines from one another indicates roughly the supposed degree of lateral relationship between the groups, which are all supposed to have originated from the Pteridosperms. To the left of the Pteridospermous line are shown those Gymnosperms which are considered to have their cones primitively unisexual and anemophilous, and to the right those which evolved on bisexual (anthostrobilate) lines and were primitively entomophilous.



## DISCUSSION.

Dr. D. H. SCOTT congratulated Mr. Parkin on his paper, which in addition to its great scientific interest, was an act of loyalty to the memory of an old friend, whose loss we all lamented.

The speaker began by showing slides of the famous *Hermosa Cycad* (*Cycadeoidea Dartoni*), one of the finest fossil plants known. On the part of the stem preserved, no less than 500 ripe fruits were present, indicating that these plants may have fruited once for all and then died down, like some palms and bamboos at the present day.

Dr. Wieland had pointed out that the Bennettitean Cycads were "the stereotyped terminal forms of a side-branch from a great plastic and dominant precursor race." He added that the former were "exceptional to the point of abnormality."

Thus Wieland, to whom, more than any other individual, our present knowledge of the Bennettiteans was due, had himself warned us not to over-estimate their importance.

What then, was the "great plastic and dominant precursor race," which formed the main stock of Mesozoic Cycads? It was represented by the Williamsonian Tribe, a varied and extensive family, which included, broadly speaking, the more ancient members of the Cycadeoid class.

Lantern-slides were shown, illustrating the flowers and vegetative parts of *Williamsonia* itself, of Mr. Hamshaw Thomas's new genus *Williamsoniella*, and of Nathorst's *Wielandiella*. The latter genera, especially, departed widely from the Cycad type, as shown by their slender, much-branched stems and simpler leaves. If the origin of Angiosperms was to be sought among the ancient Cycadophytes, it was probably with the Williamsonian Tribe that the closer relation existed.

In these days one had learnt greater caution in speculations on phylogeny. Mr. Parkin had stated his case with becoming moderation and had shown that the derivation of the Flowering Plants from the great Cycadeoid plexus of the Mesozoic Age, was at least a tenable hypothesis.

Mr. H. HAMSHAW THOMAS (visitor) contended that all evolutionary theories must be concordant with Palæobotanical facts. Recent work shows that in the Middle Jurassic a group of plants existed as Angiosperms, though considerably different from those now existing. In some of the Jurassic Bennettitales are a few characters similar to those occurring in Angiosperms of to-day, but differing markedly in the structure of the gynoecium.

In the same bed as *Williamsoniella*, the speaker had unearthed female inflorescences and fruits of two genera which are undoubtedly Angiosperms, though their microsporangia or male flowers have not been found. These genera are *Gristhorpia* and *Caytonia* and were displayed in a series of lantern-slides; they probably bore leaves of the type long known as *Sagenopteris*,

formerly ranked amongst the Marsileaceæ on account of their shape and reticulate venation.

It is quite open to question whether these Caytoniales had any relationship to modern Angiosperms. They show that the Angiospermous type of gynoecium evolved at an early date, and that the plants which achieved this advance still had characters of a gymnospermous type, especially as regards their seeds.

Professor F. W. OLIVER inquired what was the author's view as to the closing of the carpels from the open state.

Dr. A. B. RENDLE contended that the paper consisted of two subjects which were unconnected with each other: the origin of Angiosperms and Bennettitales. He deprecated the designation of the theory as the Strobilus theory; that title would be equally applicable to other theories. He also protested against the attempt to derive the whole of the modern Angiosperms from the Ranalian plexus. The modern German system had done good service in indicating the affinities of certain orders of Dicotyledons, which had been separated from their allies by the French system, developed by Bentham and Hooker, on account of their apetalous character. But there were groups, such as the Amentiferae, which might be regarded as descendants of older forms, contemporary with, or earlier than, the immediate ancestors of the Ranales. There were presumably many stages in the evolution of the modern Angiosperms, and it seemed more in accordance with facts to regard some of the modern apetalous groups as descendants from one or other of these.

Mr. PARKIN briefly replied to the observations contributed by the speakers.

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### The Geographical Distribution of some Transvaal Leguminosæ.

By J. BURTT-DAVY, F.L.S.

[Read 7th June, 1923.]

As far as available data enable us to show, the Leguminosæ form the largest family of Transvaal Spermatophyta, as regards numbers of species, having about 100 species more than the Compositæ, and comprising nearly 10 per cent. of the recorded species of the flora. The subfamily Papilionaceæ includes fifty-eight genera and 428 species; excluding the aliens, and the genus *Indigofera* which is not yet fully worked out, we have fifty genera and 325 species. Since the first Check-list of Transvaal Flowering Plants was published in 1911, the number of recorded species of Papilionaceæ has been nearly doubled. A large number of the genera have very few species, and there are few genera with many species, *i. e.*, forty-five species are distributed among thirty genera, while 188 occur in four genera. As a general rule, the genera with few species have no endemics; the greatest number of endemics occur in genera with the greatest number of species; but some of

the large genera have a small proportion of endemics, e. g., *Crotalaria*, with thirty-three species, and *Tephrosia*, with thirty-one, have only eight and nine endemics respectively.

The species show great variation in range, even in the same genus; some range almost the length of the Continent; others are restricted to very limited areas; every possible variation of range between these two extremes is covered by the majority of the species.

Classified according to their geographical range of distribution, the Papilionaceæ fall into five very distinct groups: (1) the South-western Cape Province Element, with only five species. When we take into further consideration the fact that eleven endemic South-western Cape genera of Papilionaceæ, with 270 species, do not occur at all in the Transvaal, it is clear that the connection between the floras of the Transvaal and the South-west Cape Province is negligible.

(2) The Kalahari Element. This comprises only nine species, confirming a much earlier-formed conclusion that the inclusion of the Transvaal in the "Kalahari Region" of the later volumes of the 'Flora Capensis' is quite misleading.

(3) The Rain-forest Element of the eastern high mountains, with only about five species.

These three elements together comprise not more than 6 per cent. of the total Papilionaceous flora. The remaining 94 per cent. (306 species) are divided between (4) the *Tropical African* Element, with 167 species (51 per cent. of the total), and (5) the *Warm Temperate Plateau* or the high-veld grass steppe flora of the eastern Transvaal and Orange Free State, and uplands of Natal, Griqualand East, Basutoland and the eastern portion of the Cape Province. This Warm Temperate Plateau Element comprises 139 species or 43 per cent. of the total.

Of these 306 species comprising the two predominant elements, 123 are endemic to the Transvaal. These endemics form 38 per cent. of the total; this proportion appears low when compared with the 72 per cent. endemics in New Zealand, or the 82 per cent. of the Hawaiian Islands. But if we add to the species which are strictly endemic within the political boundaries of the Transvaal, those species which range into the Border States but not beyond them, the number of endemics in the thus enlarged area is 78 per cent. of the population. In other words, if the Border States were to be submerged to-day, leaving the Transvaal as an island, we should have 78 per cent. of its Papilionaceæ as endemics, and 22 per cent. would be "wides" occurring also on the mainland.

Thus the only reason that we have such a small percentage of endemics in the Transvaal to-day is that some of them range across the political boundaries into Border States, while in the case of islands, the oceans have formed an insuperable barrier, either preventing the spread of species evolved since the isolation occurred, or destroying the individuals which had spread before the submergence of outlying territory.

The endemic genera of Africa are of two kinds: (*a*) those which are obviously "relicts" as Tansley terms them, e. g., *Eucephalartos*, *Stangeria*, *Gnetum*, *Welwitschia*, *Adansonia*, *Sterculia*, etc., some of which are extremely local in their distribution, while others are wide spread; and (*b*) those which are in a state of flux, still developing new species and varieties, e. g., *Pearsonia*, *Pleiospora*, *Lotononis*, etc.

Fifteen species (less than 5 per cent.) are common to the Transvaal and India, and five species are found in Madagascar; the Malagasy Element may be found to be larger when the scattered literature has been collected into accessible form, and the scattered herbarium material has been more critically studied.

In connection with the view that, in some families at least, the arborescent forms are the older types, it is instructive to find that, with one exception, possibly introduced, the arborescent and shrubby species of Papilionaceæ (only about twenty in all) belong to the Tropical African Element, and that about half of them belong to genera with few species, four of the genera being monotypic. The Warm Temperate Plateau Element is made up, to an extraordinary degree, of species which have developed the suffrutescent habit, there being very few herbs and scarcely any annuals among them.

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## BENEFACTIONS.

*LIST in accordance with Bye-Laws, Chap. XVII. Sect. 1, of all Donations of the amount or value of Twenty pounds and upwards, received during the past Twenty years.*

## 1904.

Royal Society: Grant in aid of third volume of the Chinese Flora, £120.

Frank Crisp, Esq. (afterwards Sir Frank Crisp, Bt.): Cost of Supplementary Royal Charter.

The same: Bulliard (J. B. F.). *Herbier de la France; Dictionnaire; Histoire des plantes vénéneuses; Champignons*, in 10 vols. Paris, 1750-1812.

## 1905.

Royal Society: First grant in aid of Dr. G. H. Fowler's 'Biscayan Plankton,' £50.

Executors of the late G. B. Buckton, Esq.: Contribution for colouring plates of his paper, £26.

## 1906.

Royal Society: Second grant towards 'Biscayan Plankton,' £50.

Subscription portrait of Prof. S. H. Vines, by Hon. John Collier.

Royal Swedish Academy of Science: Copies of portraits of C. von Linné, after Per Krafft the elder, and A. Roslin, both by Jean Haagen.

## 1907.

Royal University of Uppsala: Copy by Jean Haagen of portrait of C. v. Linné, by J. H. Scheffel (1739).

Royal Society: Third and final grant towards 'Biscayan Plankton,' £50.

The Trustees of the Percy Sladen Memorial Fund: First grant towards publication of Mr. Stanley Gardiner's *Researches in the Indian Ocean in H.M.S. 'Sealark,'* £200.

## 1908.

Prof. Gustaf Retzius: Plaster cast of bust of Carl von Linné, modelled by Walther Runeberg from the portrait by Scheffel (1739) at Linnés Hammarby: the bronze original designed for the façade of the new building for the Royal Academy of Science, Stockholm.

Miss Sarah Marianne Silver (afterwards Mrs. Sinclair), F.L.S.: Cabinet formerly belonging to Mr. S. W. Silver, F.L.S.

## 1909.

- The Trustees of the Percy Sladen Memorial Fund: Second grant towards publication of Mr. Stanley Gardiner's *Researches in the Indian Ocean in H.M.S. 'Sealark,'* £200.  
 Prof. James William Helenus Trail, F.R.S., F.L.S.: Gift of £100 in Trust, to encourage Research on the Nature of Proto-plasm.

## 1910.

- Royal Society: Grant towards Dr. G. H. Fowler's paper on Biscayan Ostracoda, £50.  
 Sir Joseph Hooker: Gold watch-chain worn by Robert Brown, and seal with portrait of Carl von Linné by Tassie.  
 Prof. J. S. Gardiner: Payment in aid of illustrations, £35 0s. 6d.  
 Sir Frank Crisp: Donation in Trust for Microscopical Research, £200.  
 The Trustees of the Percy Sladen Memorial Fund: Third grant towards publication of Prof. Stanley Gardiner's *Researches in the Indian Ocean,* £200. (For third volume.)

## 1911.

- The Trustees of the Percy Sladen Memorial Fund: Second Donation towards the publication of the third volume on the Indian Ocean *Researches,* £70.  
 The same: First Donation towards the fourth volume, £130.

## 1912.

- The Indian Government: Contribution towards the illustration of Mr. E. P. Stebbing's paper on Himalayan *Chermes,* £46 15s. 2d.  
 The late Mr. Francis Tagart, £500 free of Legacy Duty.  
 The late Sir Joseph Dalton Hooker, O.M., G.C.S.I., £100 free of Legacy Duty.  
 The Trustees of the Percy Sladen Memorial Fund: Second Donation towards the publication of the fourth volume on the Indian Ocean *Researches,* £140.  
 The same: First Donation towards the fifth volume, £50.

## 1913.

- Royal Society: Grant towards Dr. R. R. Gates's paper on Mutating *Oenotheras,* £60.  
 Sir Frank Crisp, Bt.: Wallichian Cabinets, £50.  
 The Trustees of the Percy Sladen Memorial Fund: Second Donation towards the publication of the fifth volume, £200.



## 1914.

- Royal Society: Grant towards Miss Gibbs's paper on the Flora of British North Borneo, £50.  
 Miss Foot: Cost of illustration of her paper on *Euschistus*.  
 The Trustees of the Percy Sladen Memorial Fund: Third Donation towards the fifth volume, £10.  
 The same: First Donation towards the sixth volume, £190.

## 1915.

- The Trustees of the Percy Sladen Memorial Fund: Second Donation towards the sixth volume, £80.  
 Miss Foot: Cost of second paper on *Euschistus*, £32 10s.  
 Royal Society: Donations towards the cost of a paper by Mrs. Arber, D.Sc., £40.  
 The same: towards paper on Utkwa River plants by Mr. H. N. Ridley, C.M.G., F.R.S., £50.  
 Miss Marietta Pallis: Instalment of cost of her paper on Plav, £30.  
 Thomas Henry Riches, Esq.: Dr. A. R. Wallace's library on Natural History.  
 Sir Frank Crisp, Bt.: New shelving for Wallace's Volumes.

## 1916.

- Mr. E. Heron-Allen: Contribution to cost of paper on Foraminifera of N.W. Scotland, £44.  
 Messrs. H. Takeda and C. West: Contribution towards the illustration of their paper, £40.  
 Royal Society: Contribution towards the illustration of two papers by Prof. Dendy, £40.  
 The same: Contribution towards Mr. Swynnerton's paper on Form and Colouring, £70.  
 The High Commission for the Union of South Africa, per Dr. J. D. F. Gilchrist, for the illustration of his paper on *Jasus Lalandii*, £30.  
 Miss Marietta Pallis: Balance of cost of her paper on Plav, £90 16s. 6d.  
 Sir Frank Crisp, Bt.: Phototyped copy of Dioscorides from the 'Codex Aniciae Julianae' at Vienna.

## 1917.

- British Ornithologists' Union, etc.: Contribution towards cost of Mr. H. N. Ridley's paper, £20.  
 The Royal Society: Second contribution towards the printing of Mr. C. E. M. Swynnerton's paper on Form and Colouring, £75.  
 Sir Frank Crisp, Bt.: 'Lindenia,' Ghent, 1891-1901. 17 vols. sm. fol.

## 1919.

Dr. B. Daydon Jackson: MS. index to Linnean Society's Journal, Botany, vols. xxi.-xl. (1884-1912) and the Botanic entries in the 'Proceedings' for the same period.

## 1920.

The Royal Society: Third contribution towards the printing of Mr. C. F. M. Swynnerton's paper as above, £50.

The High Commission for the Union of South Africa, for the printing of Dr. J. D. F. Gilchrist's paper on *Jasus Lalandii*, Part II., £60.

## 1921.

The Percy Sladen Memorial Fund: Additional Grant in aid of publication of 'Transactions,' 2nd ser., Zoology, vol. xvii. part 4, £72 10s.

The same: Grant in aid of publication of four papers on the Houtman Abrolhos Islands, £100.

The Royal Society: Donation in aid of papers by Mr. N. E. Brown and Mr. S. L. Moore, £90.

Dr. W. Rushton Parker: Donation of a large series of portraits of Naturalists and Persons after whom Genera have been named, and work on rearrangement and annotation of the entire collection.

Prof. C. S. Sargent, F.M.L.S.: Eight volumes issued by the Arnold Arboretum, including "The Bradley Bibliography."

## 1922.

The late Sir Joseph Hooker: Donation of his Medals and Decorations. (Reversion to Linnean Society on Lady Hooker's decease.)

Anonymous donation in aid of publication of the late Dr. E. A. Newell Arber's paper, entitled "Critical Studies of Coal-Measure Plant-impressions," £60.

## 1923.

Dr. W. Rushton Parker: (1) Donation of Oxford New English Dictionary; vols. i.-ix., vol. x. in parts, 4to, 1888-1923  
(2) Encyclopædia Britannica; ed. XI. Cambridge, 1920-22, 32 vols. 4to.

# ADDITIONS AND DONATIONS

TO THE

## LIBRARY.

1922-1923.

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- Algiers. Société d'Histoire Naturelle de l'Afrique du Nord.  
Bulletin. 1→ Svo. *Alger*, 1910→
- Arber (E. A. Newell). Devonian Floras. A Study of the Origin  
of Cormophyta. Svo. *Cambridge*, 1921. Dr. A. Smith Woodward.
- Babington (Charles Cardale). Manual of British Botany. Con-  
taining the Flowering Plants and Ferns arranged according to  
the Natural Orders. Ed. 10. Edited by A. J. WILMOTT.  
Svo. *London*, 1922.
- Bailey (L. H.). The Standard Cyclopedia of Horticulture. 6 vols.  
4to. *New York*, 1919.
- Baker (E. C. Stuart). See Blanford (W. T.). The Fauna of  
British India—Birds. Vol. I.
- Bevan (E. J.). See Cross (C. F.).
- Black (J. M.). Flora of South Australia. Part I. Cyatheaceæ-  
Orchidaceæ. Svo. *Adelaide*, 1922.
- The Naturalized Flora of South Australia.  
Svo. *Adelaide*, 1909.
- Blanford (W. T.). The Fauna of British India, including Ceylon  
and Burma. Birds. Vol. I. (Ed. 2). By E. C. STUART BAKER.  
Svo. *London*, 1922.
- Botanisches Archiv. Zeitschrift für die gesammte Botanik.  
Herausgegeben von Dr. CARL MEZ. Bd. 1→  
4to. *Königsberg*, 1922→
- Bower (F. O.). The Ferns (Filicales). Vol. I. (Cambridge  
Botanical Handbooks.) 4to. *Cambridge*, 1923.
- British Museum (Natural History).  
Catalogue of the Books, Manuscripts, Maps, and Drawings in  
the British Museum (Natural History). Vol. VI., Supple-  
ment A-I. 4to. *London*, 1922.

### MAMMALS.

- Catalogue of the Selous Collection of Big Game in the British  
Museum (Natural History). Svo. *London*, 1921.

### REPTILES.

- Monograph of the Lacertidæ. By GEORGE ALBERT BOULENGER.  
Vol. II. Svo. *London*, 1921.

## British Museum (cont.):—

## FOSSILS.

- Catalogue of the Fossil Bryozoa (Polyzoa) in the Department of Geology, British Museum (Natural History). The Cretaceous Bryozoa (Polyzoa). Vol. IV. The Cribrimorphs. Part II. By W. D. LANG. Svo. London, 1922.
- Bromfield (William Arnold). Flora Vectensis. 2 vols. (Annotations by A. G. MORE). Svo. London, 1856. H. J. Jeffery.
- Supplement. See MORE (A. G.).
- Brunet (Jacques Charles). Manuel du Libraire, etc. 5 vols. Svo. Paris, 1842-1844. Dr. W. Rushton Parker.
- Buller (A. H. Reginald). Researches on Fungi. Vol. II. Svo. London, 1922.
- Butler (Edward A.). A Biology of the British Hemiptera-Heteroptera. 4to. London, 1923.
- Camus (A.). Les Cyprès. Genre *Cupressus*. 4to. Paris, 1914.
- Carpenter (George H.). Insect Transformation. Svo. London [1921].
- Chipp (T. F.). The Forest Officers' Handbook of the Gold Coast, Ashanti, and the Northern Territories. Svo. London [1922]. Author.
- Clarke (J. Jackson). Protists and Disease. Svo. London, 1922. Author.
- Cockayne (L.). See Engler (A.) and Drude (O.). Die Vegetation der Erde. XIV.
- Cross (C. F.) and Bevan (E. J.). Cellulose. Svo. London, 1895. Dr. W. Rushton Parker.
- Cumming (Linnæus). List of the Plants found in the country around Rugby. Svo. Rugby, 1923.
- Davey (F. Hamilton). Flora of Cornwall. A Supplement by EDGAR THURSTON and CHAMBRÉ C. VIGURS. (Royal Inst. Cornwall Journ. xxi.) Svo. Truro, 1922.
- Dennistoun (James). Memoirs of the Dukes of Urbino. 3 vols. Svo. London, 1851. Dr. W. Rushton Parker.
- Engler (Adolf) and Drude (Oscar). Die Vegetation der Erde. Svo. Leipzig, 1896-1923.
- XIV. The Vegetation of New Zealand. By L. COCKAYNE. 1921.
- XV. Die Pflanzenwelt der bolivischen Anden und ihres östlichen Vorlandes von Prof. Dr. TH. HERZOG. 1923.
- Gardner (George). Musci Britannici or Pocket Herbarium of British Mosses. Svo. Glasgow, 1836. Miss May Rathbone.
- Guérin-Méneville (F. E.). Iconographie du Règne Animal de G. Cuvier, etc. 3 vols. Svo. Paris & Londres, 1829-44. Hugh Findon.
- Gunther (R. T.). Early British Botanists and their Gardens. Based on unpublished writings of Goodyer, Tradescant, and others. Svo. Oxford, 1922.
- Hall (Sir Alfred David). The Soil. Svo. London, 1903. Dr. W. Rushton Parker.
- Herzog (Th.). See Engler (A.) and Drude (O.). Die Vegetation der Erde. XV.

- [Hill (John).] Eden: or a compleat body of gardening, . . . from the papers of the late Mr. Hale. Folio. London, 1757.
- Hirmer (Max). Zur Lösung des Problems der Blattstellungen. Svo. Jena, 1922.
- Howard (H. Eliot). Territory in Bird Life. Svo. London, 1920.
- Howarth (O. J. R.). The<sup>rd</sup> British Association for the Advancement of Science. A Retrospect. 1831-1921. Svo. London, 1922.
- Hutchinson (Rev. H. M.). Extinct Monsters. Svo. London, 1897. Dr. W. Rushton Parker.
- Johansson (K.) and Samuelsson (G.). Dalarnes *Hieracia* Vulgatifornia. Svo. Leipzig, 1923. Authors.
- Journal of Indian Botany. Edited by P. F. Fyson. Vol. I. Svo. Madras, 1919.
- Kanehira (Ryozo). Anatomical Characters and Identification of Formosan Woods.—Identification of the important Japanese Woods by Anatomical Characters. (Supplement.) 4to. Taihoku, 1921.
- Knoche (Herman). Flora Balearica. Étude Phytogéographique sur les Iles Baléares. I. Svo. [Montpellier] 1921. Author.
- Komai (Taku). Studies on Two Aberrant Ctenophorea, *Coloplana* and *Gastrodes*. 4to. Kyoto, 1922. Author.
- Le Maout (Emm.) et Decaisne (Jos.). Traité général de Botanique. Descriptive et Analytique. Ed. 2. 4to. Paris, 1876. L. L. Belinfante.
- Liddle (Henry George) and Scott (Robert). A Greek-English Lexicon. Ed. 7. 4to. Oxford, 1883. Dr. W. Rushton Parker.
- Lubbock (Sir John, afterwards First Baron Avebury). The Origin of Civilisation and the Primitive Condition of Man. Svo. London, 1889. Dr. W. Rushton Parker.
- Pre-historic Times as illustrated by Ancient Remains and the Manners and Customs of Modern Savages. Svo. London, 1900. Dr. W. Rushton Parker.
- Lyell (Sir Charles). Principles of Geology. Svo. London, 1850. Dr. W. Rushton Parker.
- The Geological Evidences of the Antiquity of Man. Svo. London, 1863. Dr. W. Rushton Parker.
- Macbride (Thomas H.). The North American Slime-moulds. Svo. New York, 1922. Miss G. Lister.
- McNicol (David H.). Dictionary of Natural History Terms. Svo. London, 1863. Dr. W. Rushton Parker.
- More (A. G.). A Supplement to the 'Flora Veetensis.' Svo. London, 1871. H. J. Jeffery.
- Munro (Robert). Rambles and Studies in Bosnia-Herzegovina and Dalmatia. Svo. Edinburgh & London, 1895. Dr. W. Rushton Parker.
- Murray (Sir John) and Hjort (Dr. Johan). The Depths of the Ocean. Svo. London, 1912.
- Oltmanns (Friedrich). Das Pflanzenleben des Schwarzwaldes. 2 vols. Svo. [Freiburg i. Br.], 1922.

- Osborn (Henry Fairfield).** Men of the Old Stone Age: their environment, life, and art.  
Svo. *London*, 1916. *Dr. W. Rushton Parker.*
- Palmer (T. S.).** Index Generum Mammalium. (U.S. Dept. Agric., N. Amer. Fauna, No. 23.) Svo. *Washington*, 1904.
- Pearce (Ethel Katherine).** Typical Flies. A Photographic Atlas of Diptera, including Aphaniptera. 2 vols.  
4to. *Cambridge*, 1915-21. *Author.*
- Pritchard (Andrew).** A History of Infusoria: Living and Fossil.  
Svo. *London*, 1845. *Dr. W. Rushton Parker.*
- Rangachari (K.).** A Manual of Elementary Botany for India. Second Edition. Svo. *Madras*, 1921. *Author.*
- Ridley (Henry Nicholas).** The Flora of the Malay Peninsula. With illustrations by J. HUTCHINSON.  
Vol. I. Polypetalæ.  
Vol. II. Gamopetalæ.  
Svo. *London*, 1922-3. **Government of the Straits Settlements.**
- Roger (Alex.).** A Handbook of the Forest Products of Burma.  
Svo. *Rangoon*, 1921. *Author.*
- Rohde (Eleanour Sinclair).** The Old English Herbals.  
Svo. *London*, 1922.
- Samuelsson (G.).** See **Johansson (K.).**
- Sargent (Charles Sprague).** The Silva of North America. 14 vols., *illustr.*  
Folio. *Boston & New York*, 1890-1902. **Tagart Fund.**
- Manual of the Trees of North America (exclusive of Mexico). Ed. 2. Svo. *London* [1921].
- Schlich (Sir Wm.).** Manual of Forestry. Ed. 4. Vol. I. Forest Policy in the British Empire. Svo. *London*, 1922. *Author.*
- Sedgwick (Adam).** A Discourse on the Studies of the University of Cambridge. Ed. 5. Svo. *London*, 1850. **H. W. Monckton.**
- Sherborn (Charles Davies).** Index Animalium sive index nominum quæ ab A.D. 1758 generibus et speciebus animalium imposita sunt . . . . Sectio secunda . . . usque ad finem 1850. Pars I.  
Svo. *London*, 1922.
- Spitta (Edmund J.).** Microscopy.  
Svo. *London*, 1907. *Dr. W. Rushton Parker.*
- Stager (Walter).** Tall Bearded Iris (*Fleur-de-Lis*). A Flower of Song.  
Svo. *Sterling, Ill.*, 1922. *Author.*
- Stone (Herbert) and Cox (H. A.).** A Guide to the Identification of the more useful Timbers of Nigeria. Svo. *London* [1922].
- Struthers (John).** Memoir on the Anatomy of the Humpback Whale (*Megaptera longimana*).  
Svo. *Edinburgh*, 1889. *Dr. W. Rushton Parker.*
- Swann (H. Kirke).** A Synoptical List of the Accipitres.  
Svo. *London*, 1919-20. *Author.*
- A Synopsis of the Accipitres. Ed. 2.  
Svo. *London*, 1921-22.
- Thomson (George Malcolm).** The Naturalization of Animals and Plants in New Zealand.  
Svo. *Cambridge*, 1922.

- Thurston (Edgar).** *See Davey (F. Hamilton).*
- Turner (Fred).** Australian Grasses and Pasture Plants.  
Svo. *Melbourne* [1921]. **Author.**
- Vigurs (Chambré C.).** *See Davey (F. Hamilton).*
- Walsh (Lt.-Col. J. H. Tull).** Plague: Recent progress in Etiology,  
Pathology, and Treatment. (Trop. Diseases Bull. xiv.)  
Svo. *London*, 1922. **Author.**
- Wilmott (Alfred James).** *See Babington (C. C.).* Manual of  
British Botany. Ed. 10.
- Wilson (Wm. F.).** With Lord Byron at the Sandwich Islands in  
1825. Being extracts from the MS. Diary of James Macrae,  
Scottish Botanist. Svo. *Honolulu*, 1922. **Author.**
- Zahlbruckner (Alexander).** Catalogus lichenum universalis.  
Band I.→ Svo. *Leipzig*, 1921→

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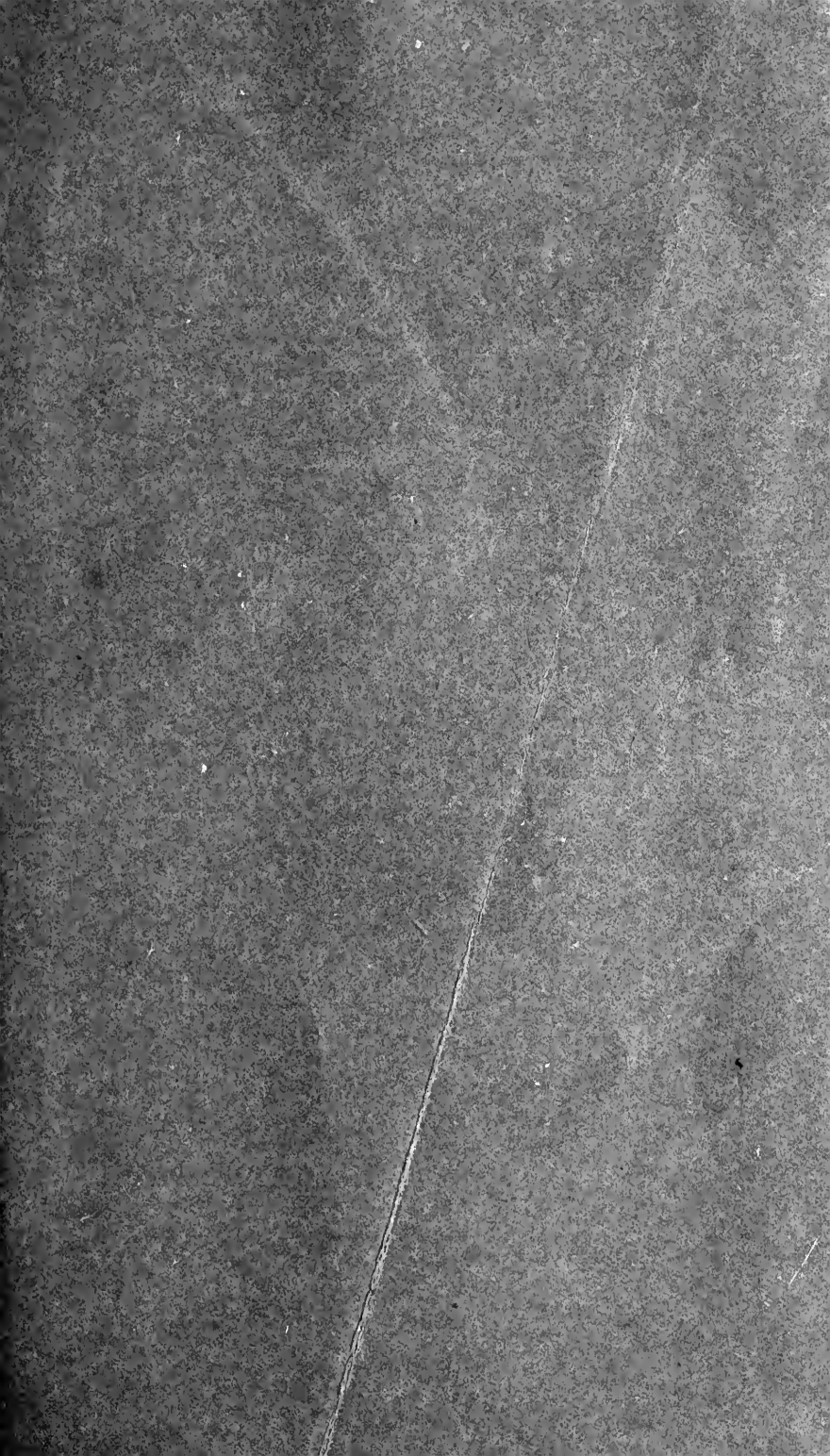
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